WORLD OIL

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Turn the page for quick guide to the articles in this issue.

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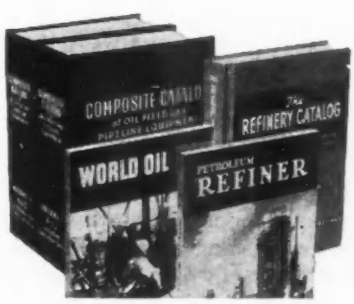

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WORLD OIL and The COMPOSITE CATALOG for the drilling-producing-pipe line industry

PETROLEUM REFINER and The REFINERY CATALOG for the refining-natural gasoline industry

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A Quick Guide to

WORLD OIL this month . . . .

Current Outlook

An oil show for oil people. Wm. B. Way, general manager of the International Petroleum Exposition in Tulsa, asked for some constructive criticism. WORLD OIL Publisher Ray L. Dudley obliges and asks—does the presence of the general public interfere with the service rendered to the industry by the exposition? There's a strong suspicion that it does and some sort of plan to limit the attendance to oil men should be devised, says Dudley. See the *Publisher's Page* on **Page 57.**

√

Retirement and then what? A survey shows that oil field workers in the Mid-Continent area have their own retirement plans, making unnecessary the counseling service now offered to some urban refinery workers in the East. Visit a lease in southern Oklahoma with WORLD OIL's Anthony Gibbon. Chat with an oil field worker who looks on the rocking chair as just another piece of furniture. *Rocking Chair Blues?* **Page 84.**

√

Here are some answers for the politicians who would propose radical changes in the existing petroleum industry transportation system—such as stricter regulation of pipe line rates or earnings or divorcement of different divisions of the industry. Here's a claim that the industry's transportation system is doing an efficient job and assuring adequate supplies to all parts of U. S. at prices within the reach of millions. **Page 86.**

. . . . . an exclusive WORLD OIL interview

What is the petroleum industry's role in the European Recovery Program through Economic Cooperation Administration and its successor, Mutual Security Agency? This question was highlighted recently in the suit filed by the U. S. Justice Department alleging overcharges on some shipments of petroleum to ECA-MSA participating countries. In the interest of a clearer understanding of the problem, WORLD OIL's editors asked Cornelius J. Dwyer, chief of the Petroleum and Petroleum Equipment Branch, MSA, some questions. Dwyer has answered in an exclusive interview beginning on **Page 75.**

C. J. Dwyer

Exploration

Southern Oklahoma prospects and present producing status are discussed in an article beginning on **Page 103.** Eight important types of structures, produced by the mountain building deformation of the Ardmore district in Pennsylvania times, are dealt with by the author.

√

Is seismology the field for you? Here's a frank discussion of the advantages and disadvantages of geophysical work from the standpoint of the workers. It should help not only men contemplating such a career, but also management of geophysical contracting companies and heads of oil company geophysical departments. **Page 112.**

√

Additional important new oil and gas fields likely will be found in the Texas Panhandle and adjacent section of Oklahoma, says Geologist Fred R. Haeberle in an article entitled *Discoveries in Panhandle Back up Geologic Theory.* Renewed interest has been stimulated by recent significant discoveries. Stratigraphic and structural conditions indicate tremendous possibilities over many counties. Reviewing the general geology and future prospects of the region, this article should be of general interest. **Page 116.**

Drilling

The answer to a toolpusher's dream. That's the way Toolpusher Charles Albright describes the new drilling barge "Blind Pass." Many problems had to be solved before this dream came true. No one had ever compounded five engines in a straight line alignment. Never has so much power and ponderous equipment been assembled on a barge. This $1,500,000 barge rig undoubtedly offers the ultimate in flexibility and portability. And the trouble-free performance on the first well offers a look into the future. Turn to **Page 139** to see if you don't agree overall drilling costs can be cut through modernization.

Use this condensed information on this month's principal articles. Run through these digests . . . . rapidly. ✓ Check those you want to read first.

Deepfreeze drilling. Naval Petroleum Reserve 4 on the northern Arctic slope of Alaska has provided some interesting answers to some unique problems of drilling in permafrost. The know-how gained by the Armed Forces will provide valuable information on the problems of mud circulation, cementing, laying of lines and piling. Lubricants and specialized equipment have been tested under wide temperature ranges. See *How Wells Are Drilled in Permafrost* on **Page 152.**

✓

Here's how to increase drilling line service. A practical and down-to-earth discussion of wire line care and cut-off practices. No complicated equations. Calculations involve simple arithmetic. And aside from techniques, the author discusses the benefits derived from a wire line maintenance program. Turn to **Page 160.**

✓

New chemical product removes mud cake. Acidizing ahead of long-string cementing has been considered with variable enthusiasm for some time. But here's an improved technique plus an effective chemical development that displaces mud cake readily without interrupting the cementing operation. **Page 168.**

✓

Tool joint care is a continuous job. A campaign by operators along this line will pay off. Here's an article that will help you gain the cooperation of drilling crews, tool yard employes and transportation men in cutting down on haphazard tool joint care. Explained in simple terms and interestingly illustrated, *How to Care for Tool Joints* will help you save money. **Page 175.**

Production

Rotative gas lift has proven successful in deep Oklahoma well. An Oklahoma first, this Gulf Oil Corporation installation has cut production costs and efficiency is high for a deep problem well. James F. McDonald, assistant district superintendent for Gulf at Kiefer, Okla., describes the problems, the installation and calculates lift efficiencies in *Rotative Gas Lift a Success in Deep Well.* **Page 195.**

✓

Improved production through better acidizing of limestone and dolomite reservoirs has been obtained by use of a new solution to 15 percent hydrochloric acid. Chemical reaction in limestone is slowed down. In dolomites it has been speeded to equalize reaction rate in both formations. Insoluble silt retained in suspension to prevent plugging flow channels. Lab tests show better penetrations. Research Chemist Paul L. Menaul tells the complete story behind this new development. **Page 200.**

✓

Has your electric motor burned out for no apparent reason? Then it's time to investigate the effects of lightning. Induced voltage surges are tremendous. But when understood, they can be dissipated without damage to electrical equipment. J. N. Poore, a petroleum industry specialist with General Electric Company, has some preventative measures to offer. *Don't Let Lightning Strike Twice.* **Page 206.**

✓

Having excessive maintenance troubles? Well if it's due to corrosion, here's some information to show how these costs can be cut drastically. Bryant W. Bradley, a corrosion engineer, tells how much was saved over a three-year period and how it was done. Turn to **Page 214.**

✓

Here's how to save time and consequently gas production in the determination of static reservoir pressure used to compute reserves. The idea is presented graphically. Basis for the idea are analyzed, field applications worked out. Dr. David Cornell of the Texas Petroleum Research Committee demonstrates practically how the shut-in period for producing gas wells can be shortened without materially effecting the accuracy of a computed static reservoir pressure. *How You Can Compute Gas Reserves More Accurately.* **Page 220.**

✓

To prevent gas lock of the bottom hole pump in a dual completion well, an Oklahoma operator modified a standard production packer by drilling a hole in it. The story with diagrams is on **Page 228.** The idea worked, too.

Pipe Line

It increases pipe line efficiency, protects engines from abrasion by dust. That's what a new type separator-scrubber has been doing for the past year. Here's something that may well lay claim to being listed

among outstanding recent developments in gas transmission equipment. **Page 249.**

√

Canada is meeting its pipe line problem. As Canada's known oil and gas reserves rise, the paralleling need for transmission lines has been underscored. What they have done, are doing and plan to do in the future to meet this need is covered in a roundup starting on **Page 252.**

√

Meet another pipe line personality. He's a man who found out one way to become a boss of the world's longest pipe line is to attack East Texas racketeers with vigor and determination. It's a fictional-like success story that started with peanuts and ended with pipe lines. **Page 257.**

√

Pete has his problems. But he'll learn. And so will you by following the misadventures of Pipe Line Pete. A new WORLD OIL accident prevention feature on **Page 260.**

√

It's new and for you. The first of a new monthly feature—*Rules of Thumb for the Pipeliner's Notebook.* It's a medium to pass along pet rules or formulae helpful in rapid calculation on pipe line matters. **Page 261.**

√

Map of the Month. As a construction project, Northeastern Gas Transmission Company's new 515-mile system into New England is almost unmatched. Recently completed, job was started in spring of 1951. At times it took almost as much time to restore the right-of-way as it did to lay the line. Line passes under 1300 rock fences. Each had to be replaced—stone by stone. For map and story see **Pages 262-263.**

√

What pipeliners are doing. Personal and pertinent information on **Page 264.** And pictorial coverage of pipeliners at the API meeting in Chicago on **Page 266.**

► International—Canadian Section

It started at Leduc—Six years ago Imperial Oil Ltd., brought in its famed Leduc 1, which set off the oil and gas boom that is still resounding along the 700,000-800,000 square miles between Fort St. John, B. C., and the U. S. border. Canada's oil and gas industry has now shed its fledging's wings. Crude reserves have spiraled from 45 million barrels to 1.75 billion barrels; gas reserves have climbed from 1500 billion cubic feet to 9000 billion cubic feet. The Canadian story is summed up by Gilbert Wilson of the WORLD OIL staff in an article beginning on **Page 283.**

Five trillion cubic feet of gas within in the next three or four years. That's the outlook for the Peace River area of northwest Alberta and northeast British Columbia. Though still relatively new, area looms as a major Western Canada gas reserve. **Page 298.**

√

What about Canada's oil future? At year's end an average of approximately $750,000 a day will have gone into Canadian exploration for and production of crude and natural gas. And tremendous sums will have been spent in building and expanding pipe lines, petro-chemical plants and expansion of refineries and marketing facilities. For a clear and concise summary of what has gone into the pie to make Canada's oil and gas industry the apple of the nation's eye, turn to **Page 308.**

√

So you want to get into the oil business in Canada. What are the necessary steps? Donn C. Langford, manager of the Petroleum and Natural Gas Division of the Canadian Bank of Commerce, has provided a convenient check list. **Page 312.**

√

How to go about getting oil or gas leases in Canada? Pertinent information is detailed in an article beginning on **Page 318.** Indications are that leasing opportunities, particularly of freehold lands, will increase during the next four years. Much of this expected activity will come from inability of present holders of extensive acreage to meet all commitments, resulting in outright surrender, sub-leasing or farming out.

√

A wet gas field of major proportions is the role being assumed by Nevis field area, northwest of Calgary in Alberta. Reserves estimated at more than 400 billion cubic feet. Field is six miles long and two miles wide. For a summary of field and drilling and completion data, see **Page 324.**

√

Things are poppin' in Saskatchewan. Results were slow when extensive petroleum exploration began in area three years ago. Not so now. Results are coming thick and fast. For a complete roundup, turn to **Page 326.**

√

Stepped-up activity in Manitoba is expected to boost that province's oil production to approximately 1000 barrels a day by year's end—almost double the September, 1952 output. Three pools have been discovered this year, in addition to drilling of numerous extensions to Daly pool at Virden. For a quick summary of what's happening there, see **Page 334.**

√

A WORLD of OIL—From Italy to Afghanistan and from Hungary to Mexico, International Editor Don Kliewer has put together another of his clear and concise reports of what's happening oilwise around the globe. **Page 342.**

Oil Show for Oil People

SOME time ago General Manager Wm. B. Way of The International Petroleum Exposition asked for constructive criticism of the Exposition. WORLD OIL, which has been a staunch supporter of the Tulsa Exposition show since its inception in 1923, has always felt free to offer constructive criticism, and now that we are again invited to offer it, we do so with the kindliest feelings in the world.

Since the first Exposition was held in the middle of Archer Street, back in 1923, we have heard one complaint repeated by oil men and equipment men during and after every Exposition. That complaint is that since the Exposition is for oil people, the presence of the general public only tends to interfere with the service rendered by the Exposition to the industry.

We think that this position is well taken. Many is the time when we have seen an oil man listening attentively to what an exhibitor was saying about a product when some well meaning citizen, not in the oil industry, stepped in and completely broke the trend of the explanation underway. Much more frequently we have seen the representative of an exhibitor pouring his heart out explaining a device only to discover that the person he was explaining it to, worked in one of Tulsa's excellent department stores.

"A fellow has only so much explanation in his system during an eight or twelve hour stint," one worn-out sales representative said. "It is a shame for him to use up his sales battery on somebody who can't possibly use the product."

• • •

WE VERY STRONGLY suspect two things:

- If a vote were taken among those connected with past exhibits, as to whether or not efforts should be made to confine attendance to oil men, for all except maybe one evening, the vote would be overwhelmingly in favor of the proposition.
- If oil men, who attend the Exposition were queried as to whether or not the attendance should be limited as in "No. 1" above, they would vote to put restrictions on the attendance—particularly those who attend the Exposition to profit from seeing or hearing new equipment demonstrated.

We know, of course, that some, possibly many, of the oil company executives who are connected with the Exposition—people not only in Tulsa but elsewhere—have felt that the Exposition offers a marvelous opportunity to develop the friendliest attitude on the part of the people in the Tulsa area toward the oil industry. In fact, we have heard some of them say so more than once.

Yet, we submit that it is not the obligation of the oil equipment companies throughout the United States to perform such a public relations act for the oil industry in Tulsa. If they should perform it in Tulsa, why not in Los Angeles, in Fort Worth, in Houston, in New York City? As a matter of fact, if there are any people in the country who ought to be well indoctrinated on the oil industry, it is the people of Tulsa. We think that they *are* thoroughly indoctrinated and that the very presence and magnitude of the oil industry in and around Tulsa has already done an excellent public relations job. If this job hasn't been done, then it is the fault of the oil companies in Tulsa and not the fault of the equipment people.

• • •

CONSEQUENTLY, WE SUGGEST that the Exposition management become very realistic and develop some sort of a plan, either to limit the attendance at the Exposition on all but a specified period to oil men or that steps be taken to mark an oil man so that an exhibitor does not talk himself out on non-prospects.

Suppose it does cut down the attendance at the Exposition. Equipment people have never been impressed by large total attendance figures announced by the Expositions either in Houston or Tulsa. When the day is over they know approximately how many interested people have come by—and it is not too big a percentage of the people who stop.

If it is to be desired to make the exposition a public relations effort, then limit the attendance, let us say, to one evening and put on a program that will "knock 'em over." A little thinking will accomplish this.

Ray L. Dudley

duplex

DUPLEX

.....a good name to remember

Baker DUPLEX Cement Wash-Down Whirler Float Shoe — Product No. 360

WHAT YOU CAN DO WITH BAKER DUPLEX EQUIPMENT

successfully cement liners, combination strings, and perform certain types of two-stage cementing.

cement blank sections of pipe below a perforated section, without any need to use auxiliary equipment.

wash out cavings ahead of the string when setting a liner. Without DUPLEX Equipment you can circulate only through the topmost perforations—with DUPLEX you can circulate clear to bottom.

you can control the amounts of materials used, and (without change) run caustic or oil, then run plastic, in sequences and quantities as desired.

you eliminate the need for auxiliary equipment (such as retainers or retrievable cementers) when you use Baker DUPLEX.

you can use DUPLEX equipment either with or without a liner hanger.

you have complete control of the liner at all times when DUPLEX Equipment is used. The liner can be raised or lowered, and is positively held down in place while cementing.

a bridging ball can be dropped (after cementing) and circulation carried on above the DUPLEX Equipment without disturbing the green cement.

Baker Combination Product No. 383 with a DUPLEX Whirler Float Collar. Cement is held above the Metal Petal Basket.

How DUPLEX Equipment is made

DUPLEX Float Shoes and Collars are similar to other Baker Float Shoes and Collars in most features, but have a female left-hand thread assembly (of drillable cast iron) accurately anchored just above the Back-Pressure Valve. By means of a mating male Left-Hand Square Thread Sub, the cementing string is easily connected to (or disconnected from) the DUPLEX Shoe or Collar.

How DUPLEX Equipment Operates

In simple liner work, a DUPLEX Wash-Down Whirler Float Shoe is connected to the bottom joint and the balance of the liner is run into the well, with the last joint held in slips or clamps. A cementing string of sufficient length then is run to connect the male Left-Hand Square Thread Sub to the female left-hand assembly in the shoe, to form a quick, fluid-tight connection.

The portion of the cementing string above the liner is then run, with the DUPLEX connection carrying the weight of the liner. After cementing, the back-pressure valve prevents any flow-back of cement slurry placed outside the liner. The cementing string is then disconnected by rotating to the *right;* excess cement washed out; and the cementing string removed from the well.

Various combinations of Baker DUPLEX Equipment are used to perform more complex operations, such as cementing behind liners at different levels; cementing above and below cavities; between producing zones; and similar work.

The Baker representative or office nearest you is available to discuss proper use of Baker DUPLEX Equipment in your well completions.

BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

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GUIDING, FLOATING AND CEMENTING EQUIPMENT

DUPLEX

The Changing Panorama

The Opportunities Are Still There . . . Let's Keep It That Way

IT SHOULD take a pretty dumb person, or a person who has been given a lot of misinformation not to know that the American way of doing business offers opportunities to every man . . . that is, every man who wishes to rise above the "just average person," to every man who wants to carve out his own future and not leave it to somebody else.

As a matter of fact, that is a fault I find with some unions—that every man is expected to submerge himself and that in this land of boundless opportunity for the person who will not submerge.

A few days ago I read something in one of our own publications which, in describing a person, said:

"A native Texan, he entered the oil business as a bookkeeper in 1916 and became president of the same firm this year," etc., etc. I happen to know the man. He is president of The Texas Company and I knew him pretty well because he was a college classmate of mine, and a neighbor as well. I know that he won his position as president of The Texas Company without a shadow of pull—on just straight merit.

And that's the point of the story. He wasn't wealthy, he didn't have powerful connections. He was just a damned good man and his company recognized it. And this story of his promotion to the presidency of one of the world's greatest companies didn't happen a score of years ago—it happened just a few months ago. It wasn't a Horatio Alger romance. It was just American business working in the manner it can work for you and your son.

Sure, this man I have just mentioned is a college man, but nowadays anybody with guts, be he poor as Job's turkey, can get a college education. A fellow can still work his way through college, and literally thousands of men are doing it right this moment.

Don't let anybody tell you that the good jobs have been saved for men with influence, men with pull. If they tell you that they are dealing in plain lies. It is true that a college education and even a specialized college education helps—but I happen to know that the president of another of America's great oil companies was raised on a farm, worked his way through college, took a job as a geologist at a figure which would be laughable now—but what he is now doing and what he now makes, his influence and his income are not laughable!

It depends—your job and your boy's future—on what you and your boy make it . . . you won't get to first base if you depend upon somebody carrying you.

Neither of the men I have referred to got where they are by taking it easy. There wasn't a 37- to 40-hour week for them. There wasn't any trickery about how they went up. They earned it.

Don't let anybody tell you you can't do the same—or your boy. The big thing is to keep it so all our boys can have that chance—and then let us encourage them to take advantage of the opportunity.

RAY L. DUDLEY

When Is $3000 Equal to $6649?

WHEN THE voters heard, "You never had it so good," many questioned the truth of the statement and a large majority decided it was "time for a change." The people knew that income gains were not real, because of the highest taxes in U. S. history and inflation that made it necessary to have one dollar to buy what 52 cents would have bought before the war.

In its "Economic Letter" of November 15, the First National Bank in Dallas stated that a family of four (husband, wife, and two dependents) with an income of $3000 before taxes in 1939 would have to have an income of $6649 in 1952 to compensate for taxes and inflation. Turned around, the figures indicated that if such a family of four received less than $6649 in 1952, it "had it better" in 1939 while receiving $3000.

While this family requires more than twice its 1939 income to be as well off as previously, families in higher income brackets would have to receive several or even many times as much as formerly. Some other equivalents were given by the bank. To equal an income of $4000 in 1939, the four-member family would need $9139 in 1952. In lieu of $5000 in 1939, there is needed $11,641 in 1952. To equal $10,000 in 1939 requires $25,607 in 1952. The full equivalent of $25,000 in 1939 is $96.447 in 1952. To equal $50,000 in 1939 there is needed $376,308 in 1952. In place of $100,000 received in 1939, the recipient, to come out as well, would have to receive $1,005,381 in 1952.

Industry to Benefit

THE PETROLEUM industry is destined to benefit greatly from the use of electronic computing machines, popularly called "mechanical brains." A few of these machines already are being tried out by several oil companies, and their application in the industry undoubtedly will steadily increase.

These modern, incredible office machines will make possible important savings of time and money in accounting operations, and also will be used to advantage for other purposes, as in solving complex problems of reservoir engineering. Heretofore, some such problems have had to remain unsolved, because of involving millions of computations.

In one particular crude oil accounting problem, that of calculating the interest owners' value of the the oil, a small electronic computer now used by one major oil company cuts a 17-hour job down to 3½ hours.

Report from the Observatory

Lower Production and Refinery Rates Needed

By **RAY L. DUDLEY**, Publisher, and **WARREN L. BAKER**, Editor

THE THREAT OF SURPLUS SUPPLIES still hangs as a cloud over the industry. Too much crude has been produced and refined in recent months. Consequently, the industry needs to proceed with caution to prevent the accumulation of excessive stocks. Lower refinery and producing rates are to be desired in view of the ample supply now on hand. Otherwise trouble lies ahead. The situation is not yet precarious, but unless changed is pointed in that direction.

A turn in the right direction was the cutting of Texas' December permissible production. While the cut was not substantial, it at least will check the preceding rise in production to record peaks. This curtailment of production may result in some improvement taking place in December, particularly since it can be anticipated that colder weather will cause higher consuming rates.

Much will depend on refining levels. While high refinery activity would draw off some of the excessive crude supply, it would create a dangerous condition in refined products. Attention now must be focused on gasoline supplies, which have been increasing rapidly in recent months and are now in a position to get out of hand quickly. Since record and apparently ample heating oil stocks exist, the reduction in runs to refineries can be put into practice. Nevertheless, refinery runs increased substantially the past month, and again were near record levels. This pushed both gasoline and distillate inventories to record season peaks.

• • •

A QUICK REVERSAL of gasoline inventories has taken place during the past two months. Under the impetus of high refining rates, stocks of motor fuel have risen to an all-time peak for this time of year. They have become larger than year ago volumes although they were beneath 1951 quantities during the several preceding months because of the refinery strike last spring.

So much gasoline has been made in recent months stocks climbed to 123⅓ million barrels by mid-November, up 1⅓ million barrels from a month ago and 7 million barrels above the end of July. At their present level, gasoline inventories are 2⅔ million barrels larger than a year ago. The end of September had found them 4½ million barrels below 1951 levels.

This rate of growth must be checked or far too much gasoline will be accumulated during the off-season winter consuming period. Such a condition would cause much trouble next spring and summer, probably leading to price cuts.

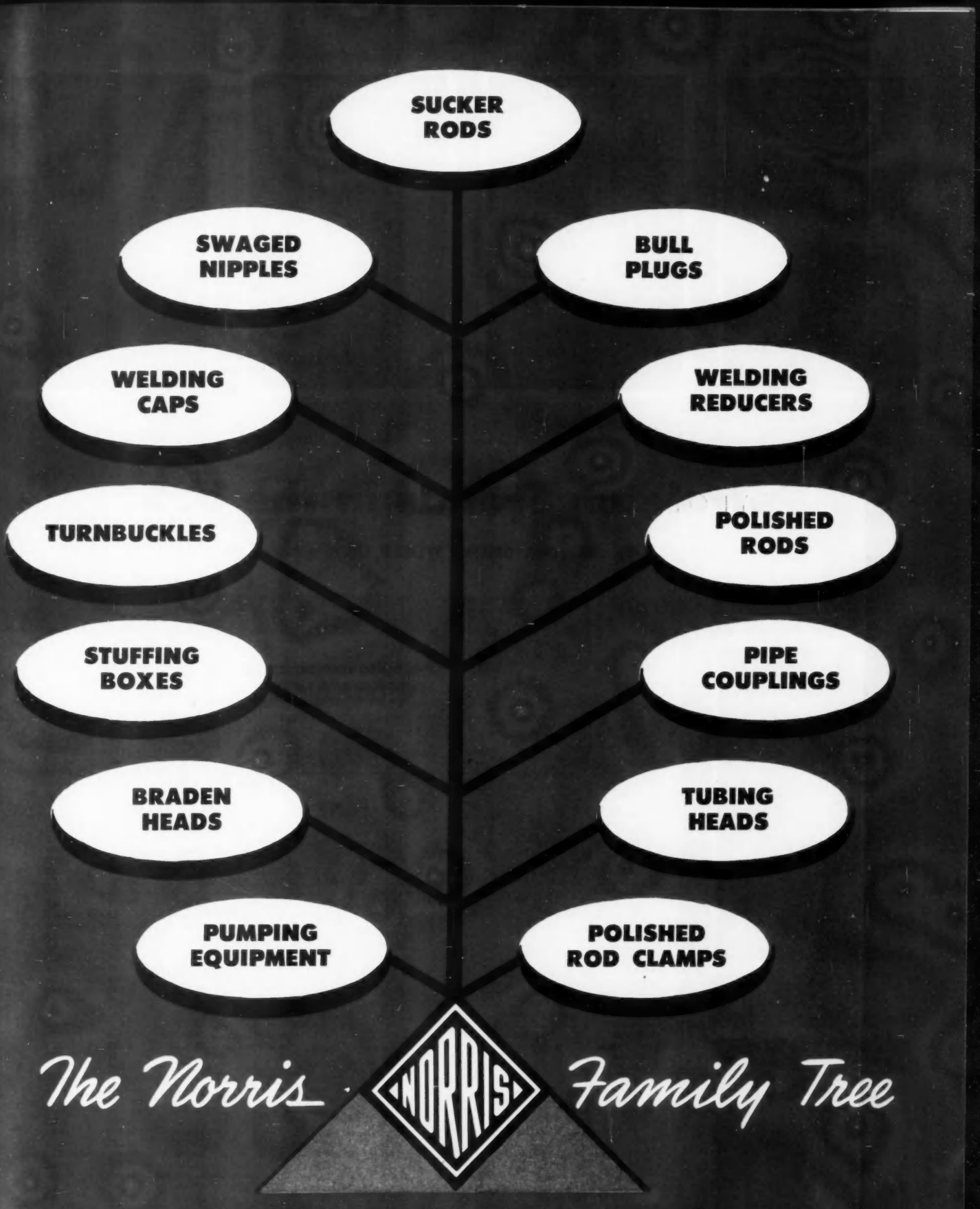
Meanwhile, large stocks of distillate are on hand, although they have started their normal winter decrease. Inventories of this product totaled 119 million barrels in mid-November, up 12 million barrels over a year ago. This will appear to be an ample volume to supply the increase in number of fuel oil heating units in service this winter.

The high level of both gasoline and distillate stocks point out the need for reducing refinery crude runs.

• • •

LARGE QUANTITIES OF CRUDE also are on hand. Due to higher refinery runs, peak production in recent weeks had not caused any appreciable change in crude stocks the past month. Nevertheless, U. S. inventories of crude totaled 266⅔ million barrels in mid-November, up 3½ million barrels from a year ago.

Causing trouble was the uneven distribution of the gains in crude stocks. Inventories in the eastern part of the United States (PAW District 1) declined nearly 1½ million barrels the past month. On the other hand stocks in the Mid-Continent and North Central area (PAW District 2) rose 2⅔ million barrels the past month. Inventories in Texas also were higher, rising over 2¾ million barrels during the past month, and now are 2 million barrels above stocks at the corresponding period of 1951. An especially large increase has occurred in West Texas stocks, which are 4½ million barrels greater than a year ago and up 1½ million barrels the past month.



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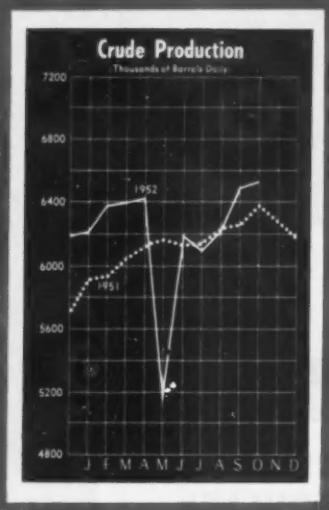
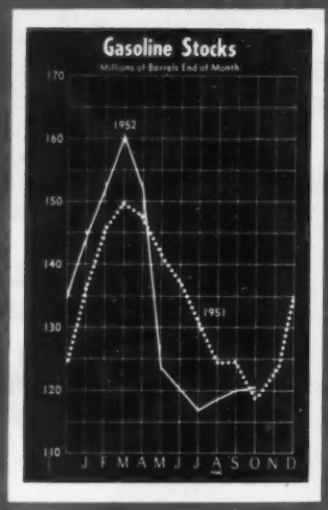
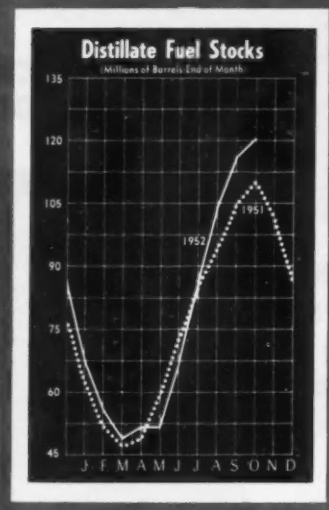
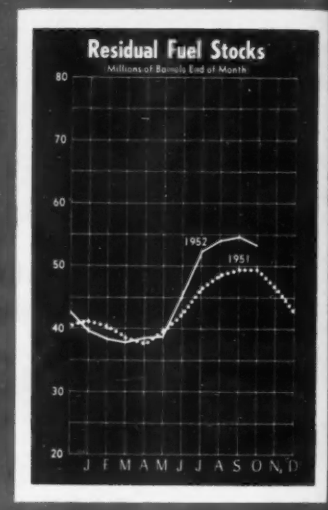


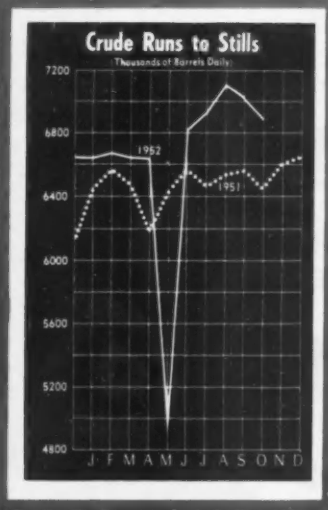


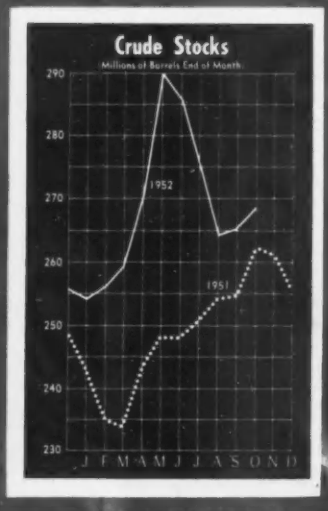




Petroleum Trends in the U. S.

By CECIL W. SMITH, WORLD OIL Staff

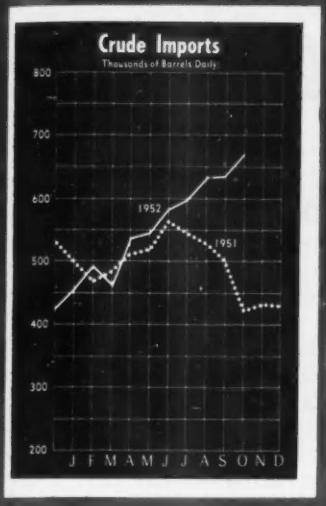


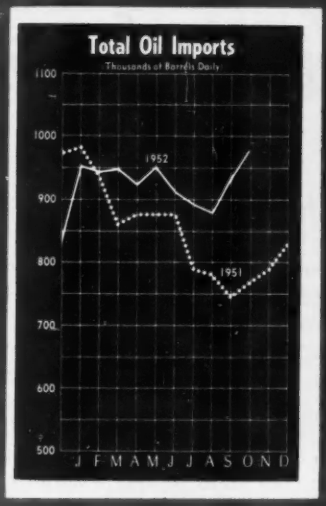


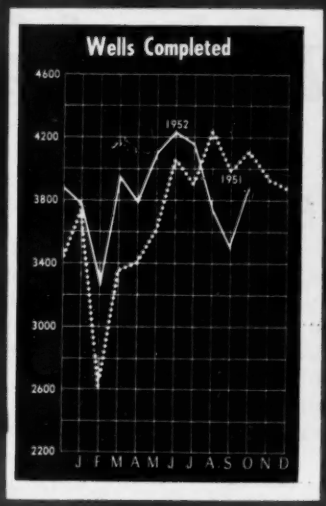
U. S. Crude Production by States

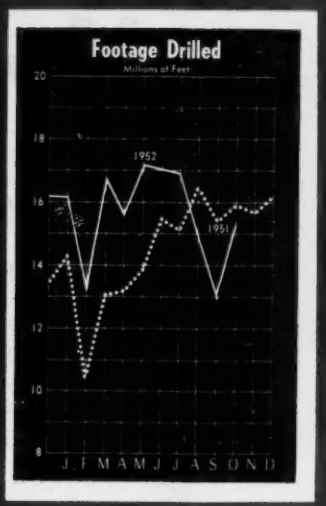
(THOUSANDS OF BARRELS)

STATE or DISTRICT	DAILY AVERAGE PRODUCTION October, 1952	September, 1952	October, 1951	% Diff. October, '51-'52	TOTAL PRODUCTION First Ten Months 1952	1951	% Diff. '51-'52
Alabama	3.1	2.9	2.7	+14.8	786	856	— 8.2
Arkansas	75.6	75.6	83.5	— 9.5	24,231	24,851	— 2.5
California	978.8	982.5	979.8	— 0.1	298,964	294,681	+ 1.5
Colorado	87.7	86.9	77.3	+13.5	24,375	22,555	+ 8.1
Florida	1.6	1.6	1.7	— 5.9	502	495	+ 1.4
Illinois	168.5	168.5	162.2	+ 3.9	48,751	48,826	— 0.2
Indiana	33.9	33.8	32.5	+ 4.3	9,959	8,737	+14.0
Kansas	343.4	334.7	328.3	+ 4.6	94,684	95,721	— 1.1
Kentucky	31.2	32.1	37.0	—15.7	10,211	9,516	+ 7.3
Louisiana	671.4	670.0	649.2	+ 3.4	198,849	192,866	+ 3.1
North Louisiana	111.7 *	112.5	117.3	— 4.8	35,258	35,929	— 1.9
South Louisiana	559.6	557.5	531.9	+ 5.2	163,591	156,937	+ 4.2
Michigan	37.3	36.2	37.9	— 1.6	11,241	11,736	— 4.2
Mississippi	95.2	95.8	101.9	— 6.6	29,979	30,927	— 3.1
Missouri	0.1	0.1	0.1	.....	18	25	—32.0
Montana	29.1	27.1	24.5	+18.8	7,684	7,477	+ 2.8
Nebraska	8.3	7.8	5.4	+53.7	1,874	2,068	— 9.4
New Mexico	170.0	162.8	152.1	+11.8	48,084	43,712	+10.0
New York	13.2	13.3	12.4	+ 6.5	3,679	3,562	+ 3.3
North Dakota	7.1	4.9	0.1	.....	898	17	.....
Ohio	9.1	9.0	9.0	+ 1.1	2,663	2,642	+ 0.8
Oklahoma	528.9	533.1	528.1	+ 0.2	159,112	155,503	+ 2.3
Pennsylvania	28.0	28.2	31.9	—12.2	9,251	9,494	— 2.6
Tennessee	0.1	0.1	.....	.....	8	12	—33.3
Texas	3,002.0	2,971.1	2,920.2	+ 2.8	845,722	838,061	+ 0.9
Dist. 1—South Central	37.2	35.3	34.9	+ 6.6	10,214	10,145	+ 0.7
Dist. 2—Middle Gulf	173.6	172.9	175.0	— 0.8	48,337	49,900	— 3.1
Dist. 3—Upper Gulf	509.2	501.5	514.3	— 1.0	143,702	150,592	— 4.6
Dist. 4—Lower Gulf-S. W.	277.1	272.5	270.9	+ 2.3	78,349	77,958	+ 0.5
Dist. 5—East Central	51.7	50.2	55.3	— 6.5	16,569	15,920	+ 4.1
Dist. 6—Northeast	381.5	397.8	393.8	— 3.1	118,673	118,395	+ 0.2
Dist. 7-B—North Central	110.6	105.0	86.6	+27.7	28,079	25,103	+11.9
Dist. 7-C—West Central	178.0	173.4	117.6	+51.4	44,150	31,111	+41.9
Dist. 8—West	1,014.2	997.0	1,005.8	+ 0.8	284,900	284,649	+ 0.1
Dist. 9—North	186.5	183.1	161.4	+15.6	50,314	47,245	+ 6.5
Dist. 10—Panhandle	82.4	82.5	84.2	— 2.1	24,990	26,695	— 6.4
Utah	4.9	5.0	3.9	+25.6	1,410	1,139	+23.8
Virginia	0.1	0.1	.....	.....	13	10	+30.0
West Virginia	7.2	6.8	7.9	— 8.9	2,141	2,309	— 7.3
Wyoming	194.3	196.0	184.8	+ 5.1	56,078	56,932	— 1.5
Total United States	6,530.1	6,486.0	6,374.4	+ 2.4	1,891,167	1,864,730	+ 1.4







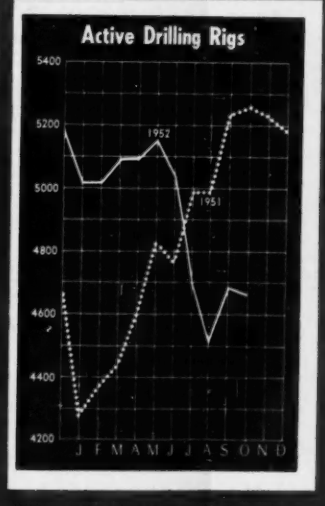


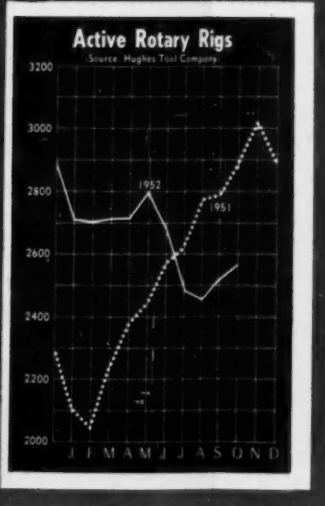
- **Crude production at peak**
- **Drilling regains losses**
- **Distillate stocks gain**
- **Imports move ahead**
- **Refining operations off**
- **Gasoline stocks spurt**

Crude Oil and Refined Products Trends

(THOUSANDS OF BARRELS)

MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL		DAILY IMPORTS	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Crude Oil	Total Oils
1950:											
August	5,665	6,067	237,393	2,932	107,067	1,089	68,426	1,148	40,979	501	839
September	5,888	6,059	242,311	2,849	105,748	1,180	78,270	1,178	41,966	525	859
October	5,900	6,077	246,424	2,875	105,764	1,217	85,643	1,250	45,004	510	896
November	5,891	6,085	250,016	2,859	109,005	1,218	86,113	1,240	45,048	466	891
December	5,719	6,143	248,463	2,879	116,769	1,343	71,948	1,306	40,750	530	974
1951:											
January	5,907	6,450	243,107	2,962	136,145	1,427	62,163	1,368	41,251	499	977
February	5,930	6,562	235,247	2,906	145,184	1,419	51,348	1,382	40,716	468	937
March	6,052	6,469	233,824	2,908	149,679	1,327	46,744	1,348	38,366	483	861
April	6,127	6,183	243,180	2,821	147,679	1,171	48,239	1,230	37,623	511	871
May	6,170	6,436	248,418	3,031	141,658	1,210	59,272	1,265	39,879	518	876
June	6,130	6,575	248,170	3,100	137,009	1,254	72,140	1,277	42,398	563	876
July	6,141	6,462	250,847	3,091	130,931	1,228	84,282	1,275	46,320	546	788
August	6,232	6,539	254,276	3,114	124,202	1,237	94,028	1,226	48,365	529	780
September	6,261	6,558	254,900	3,127	124,530	1,282	104,082	1,228	49,608	500	744
October	6,375	6,446	262,266	3,105	118,864	1,295	109,544	1,224	49,573	421	769
November	6,272	6,609	261,100	3,130	122,723	1,358	101,666	1,304	46,491	425	802
December	6,182	6,646	255,783	3,150	134,867	1,442	86,619	1,313	42,853	423	834
1952:											
January	6,217	6,640	254,007	3,094	144,339	1,456	66,969	1,338	39,523	488	951
February	6,367	6,673	255,900	3,109	151,912	1,528	55,369	1,322	38,295	491	940
March	6,388	6,640	259,126	3,069	160,689	1,400	48,750	1,274	37,971	510	947
April	6,429	6,435	270,679	2,995	151,890	1,312	51,634	1,253	38,561	539	922
May	5,107	4,905	290,813	2,295	123,656	982	51,648	979	38,821	545	951
June	6,197	6,825	285,964	3,169	120,166	1,455	65,911	1,228	45,688	581	911
July	6,093	6,927	275,951	3,295	116,566	1,475	85,775	1,237	52,245	597	892
August	6,219	7,118	264,368	3,377	118,592	1,514	104,257	1,252	54,061	632	879
September	6,486	7,018	265,152	3,388	120,069	1,481	116,163	1,243	54,597	635	933
October	6,530	6,900	268,384	3,296	120,592	1,460	120,250	1,211	53,408	671	983
Oct., 1952 Change:											
In Month	+44	—118	+3,232	—92	+523	—21	+4,087	—32	—1,189	+36	+50
In Year	+155	+454	+6,118	+191	+1,728	+165	+1,386	—84	+3,835	+250	+214
Week Ended:											
11-8-52	6,612	6,860	267,699	3,352	121,374	1,482	120,146	1,211	53,602	513	415
11-10-51	6,204	6,573	261,202	3,070	109,455	1,340	102,687	1,297	48,100	385	422





Monthly News Analysis

Election Spreads Hope for Broad Changes in U. S. Government

Many businessmen, including some in the petroleum industry, have publicly expressed hope and confidence over the outcome of the recent general election. The comments indicate strong hope for broad and constructive changes in both government and economy of the U. S.

No abrupt and sharp change in business activity is expected. But it is felt that there will be gradual changes in business policies and practices in such matters as expansion, marketing, and finance, as individual companies comprising the whole business structure readjust their individual courses.

Businessmen say that they do not want or expect any favoritism. They agree that some social gains were made in the past two decades and that those gains should be held. They do not want repeal of measures which may protect employes and consumers against selfish exploitation. But they hope that the punitive, discriminatory attitude toward business, as often expressed in bureaucratic action of the past 20 years, will be replaced by a more temperate approach and that there will be more equity in relations between the government and business. The pendulum had swung too far to the left, it is widely felt, and the threat to the American citizen's liberties, initiative and security had become ominous.

Now the pendulum is swinging back toward center, it is stated. General Eisenhower has expressed his intention to pursue a middle course and to avoid extremes of either the right or left. An important factor is his winning the election was his recognized ability to compromise opposing views and direct conflicting forces into concerted movement forward.

The new administration and the new Congress may be expected to respond promptly and aggressively to the voice of the clear majority of the people, as expressed in the election, businessmen state; and in responding, they will gradually establish improved conditions for all phases of business activity. The nation has turned from far left to center, business spokesmen declare, and has done so in such decisive manner as to leave no room for doubt.

It seems clear, say businessmen, that the people have voted to achieve some important changes and reforms. Among the things that the people apparently have ordered the government to do are the following:

- Reverse the trend toward national socialism and dangerous inflation.
- End the growth of labor monopoly.
- Stop squandering our natural and productive resources.
- Restore incentive to the individual citizen and remove the harassing and unfair restraints that have been placed upon private initiative and individual freedom.
- Return to the high moral and spiritual standards upon which our nation was founded.
- Deal realistically with matters of foreign policy.

The Republicans will control both Presidency and Congress for the first time since 1930. Although the Republicans have very slim majorities in both House and Senate, they will have strong support of Southern Democrats in domestic affairs.

Under the new government, wage and price controls probably will be promptly scrapped, and the controlled materials plan may be soon terminated, unless international developments turn less favorable. Thus businessmen are justified in hoping for less government interference in the future.

Prospects also look better as regards taxes, with elimination of the excess profits levy now very likely. President-elect Eisenhower has pledged a sincere effort to lower taxes, though the reduction may have to be small in 1953, then larger in 1954 and 1955. In order to reduce taxes, cuts in government spending have been promised and almost certainly will be made. Proven budget cutters will head both House and Senate committees that deal with appropriations and expenditures.

One result of the election of importance to the petroleum industry specifically will be new action on the states' rights to the tidelands. Quitclaim legislation very likely will be passed by Congress and signed by the new President, following his campaign promise not to veto such a measure. Clearing up of state titles to the submerged lands would reopen them to oil and gas exploration and development. Currently, oil companies have tidelands investments of millions of dollars tied up, pending settlement of the federal claims to the ownership.

Recession Threat to Industry Discounted

With benefit of traditionally stable demand for oils, the petroleum industry likely will continue to experience good business results, despite a possible temporary decline of business in general about six to nine months from now. This forecast was offered by Dr. Marcus Nadler, professor of finance, New York University, New York, at the American Petroleum Institute's annual meeting in Chicago recently.

"The consensus at present seems to be that business will remain at a high level during the next six to nine months and then witness a decline, Dr. Nadler stated. Beyond that time, forecasters are reluctant to express opinions, because of serious international political uncertainties, which can greatly affect the economy.

The international economic situation is of the utmost importance to the oil industry, Dr. Nadler pointed out. The industry has made huge investments abroad. It has a great stake in maintaining international political stability. It also has an important interest in the economic and financial recovery of the free world and the restoration of currency convertibility on current account.

So far as the oil industry specifically is concerned, said Dr. Nadler, the outlook is bright. The demand for petroleum will continue to rise, although perhaps at a slower rate than in recent years. There will be more cars on the roads, more diesel engines in use, more farm equipment to fuel and lubricate, more homes heated by fuel oil, and sharply increasing use of petroleum as raw material for production of chemicals.

As with the rest of the economy of the country, the oil industry will have

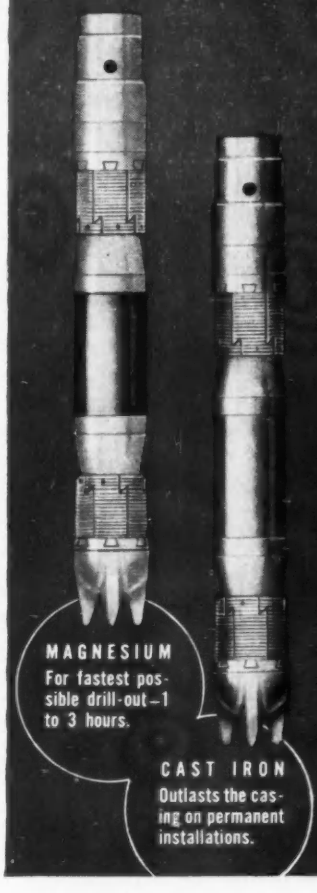
False Bottom

Upper Zone Testing and Completion

Testing Multiple Zones

.. for any or all of these jobs

Abandonment



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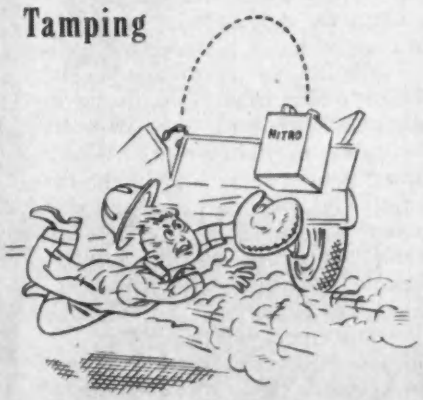

Squeeze Operations

Casing Recovery

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its ups and downs. But as experience has shown, even a sharp decline in business activity, such as that in 1938, does not lead to any significant reduction in the consumption of gasoline.

The present high level of business almost certainly will be maintained for at least some months because of large military and capital expenditures. But the sellers' market is rapidly coming to an end, and before many months are over, the buyers' market will reassert itself with full force in all lines, Dr. Nadler stated. Because of the increased productive capacity of the country and increasing competition from abroad in the domestic as well as the foreign markets, business will be more keenly competitive than it has been for a great many years.

When the downward readjustment of business comes some time in 1953 or in 1954, it is not likely to be very serious in character nor last very long, in Dr. Nadler's opinion. He bases this cheerful view on several considerations, including the dynamic nature of the U. S. economy, strong financial positions of companies and individuals, continuing decentralization of population from crowded cities, strong credit and capital structures, increased investing in business by institutions, emphasis on continuing installations of machinery and equipment that afford business economies and promote lower costs and prices, and the safeguards of social security that have been built into the U. S. society, such as old age pensions, unemployment compensation, bank deposit insurance, and farm price supports.

High Taxes Threaten Needed Expansion, Says API President Porter

Present excessive taxes seriously threaten the ability of the petroleum industry to continue expansion needed to meet the constantly increasing demand for oils. This danger was emphasized by Frank M. Porter, New York, president of the American Petroleum Institute, in addressing that association at its annual meeting in Chicago.

"It will indeed be difficult under the circumstances to meet the capital requirements without outside financing," he said. "If large borrowings are actually required, the time of their repayment will depend very largely on the extent of future tax rates."

Federal income taxes currently are consuming from 52 to 70 percent of corporate profits above $25,000, the API president said. Similarly, he continued, "oppressive rates ranging from 24 to above 90 percent are being paid by individual business men.

"How much longer," he asked, "can oil companies and individuals continue to assume the extraordinary hazards of searching for new oil reserves and pay out such large proportions of their income to the tax collectors?"

Porter, who also is president of Fain-Porter Drilling Company, Oklahoma City, continued:

"Our ability to continue finding oil and gas reserves is now so closely related to the tax burden that repeal or reduction of the statutory depletion allowance by Congress would actually be an exercise of the power to destroy this industry through taxation."

Porter said the "constant striving on the part of some in government and certain governmental agencies" to secure repeal or reduction of the depletion allowance represents an "ever present threat" to the oil industry.

"When business and industry cannot retain sufficient profits to cover replacements and maintain production," Porter asserted, "then the processes of liquidation have set in. This point actually has been reached in many units of industry already. It is only a matter of time, under present tax burdens, when all units of industry will commence to experience such economic decay.

"In the last six years," said Porter, "the federal government has collected and spent more tax revenues than it did in the previous 150 years." The high taxes have placed a serious handicap upon the future expansion of our national economy," he continued.

If continued, Porter warned, "our existing tax burden is certain to destroy the social and economic structure of this country."

He also asserted that "our traditional form of government will not be restored until we limit the federal government's access to the public pocketbook and rehabilitate the integrity of state and local government."

Gradual Rise in Williston Basin Crude Production Is Forecast

Conservative forecasts indicate that crude oil production of the Williston Basin will steadily increase from the current 10,000 barrels daily. The rise in output is expected to be gradual because of depending largely on expansion of markets and demand in the adjacent region. Such expansion will depend, in turn, on construction of refineries and pipe line systems for handling crude and products.

One forecaster recently predicted that output would reach 100,000 barrels per day within five years, or by 1958. Another estimated that the big basin's "local market" and production would reach 300,000 barrels a day by 1965.

Market analysts say that Canadian production will prevent Williston oil from finding a market to the north and may keep it out of the U. S. Pacific Northwest. The analysts add that transportation economics and the competition of other producing areas in the U. S. will limit the market for Williston oil to the North Central states. As Williston productive capacity increases and meets a large part of the local demand, it is believed, the supply sources now serving that area will replace and in turn will be absorbed in other expanding market areas.

The Williston basin oil has several handicaps from the standpoint of marketability. The oil so far encountered has been good, light crude of 30 to 40 degrees gravity but has been lacking in some desirable characteristics. It does not have access to low cost water transportation, nor are there heavily populated consuming areas close at hand. Some of the wells are completed as pumping wells, although others flow initially, with production apparently obtained by water drive in many cases. Where pumping is necessary early in the life of a well, the cost of its production is increased accordingly. Costs of drilling and production are made comparatively high also by the depths of 7,000 to 12,000 feet to the oil zones and various operating problems.

Oil was discovered in the Williston Basin in April, 1951, and some geolo-

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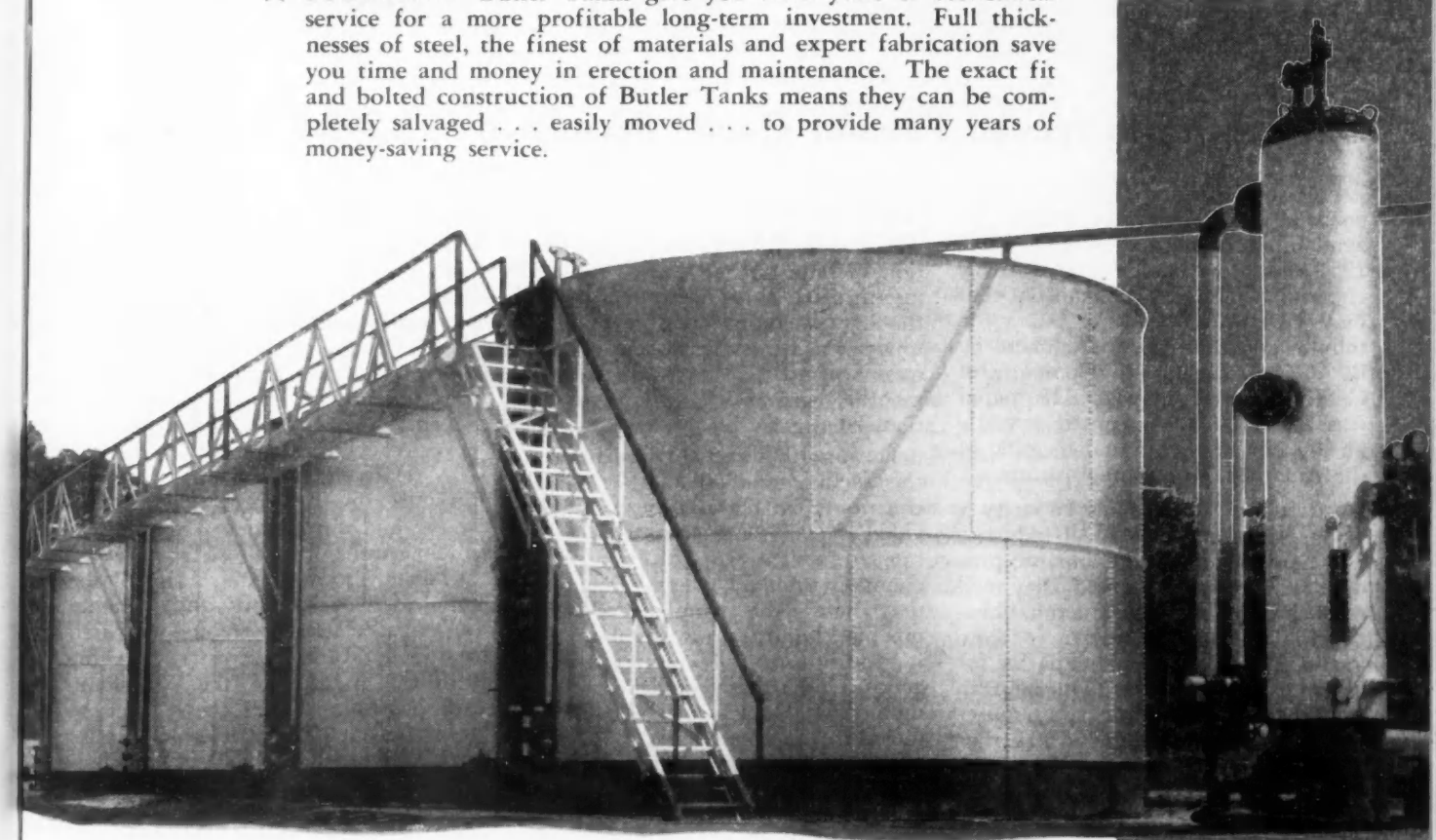

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gists have estimated that this 100 million-acre area has potential reserves of more than 2½ billion barrels. The basin includes portions of Montana and the Dakotas in the U. S. and Saskatchewan and Manitoba in Canada. It is one of the largest sedimentary basins in continental North America.

The present production of the basin is not being entirely absorbed by the local market. Major pipe lines are several hundred miles distant. Heavy capital investments will be required for transportation and refining facilities in order to further develop the area.

Since discovery of Beaver Lodge field, North Dakota, in April, 1951, about 75 new field wildcats have been drilled in the U. S. portion of the basin. These have resulted in 13 discoveries, a success ratio of 1 in 6, compared with 1 in 9 for the country as a whole in the past 10 years. At present there are 80 drilling rigs and 120 seismic crews at work in the area. Total personnel in exploration and production is estimated at 6500. Including the cost of acquiring land, the industry currently is spending about $100 million a year in the area, and total expenditures to date have been about $200 million. About 80 percent of the potential area is now under lease.

Most of the fields so far found are on two great anticlinal trends, the Nesson anticline in North Dakota and the Baker-Glendive or Cedar Creek anticline in Montana. The original discovery, Beaver Lodge, on the Nesson anticline, encompasses probably 25,000 acres. Fifty oil wells have been completed in this field. Their potential is much greater than 10,000 barrels per day, although production is limited by market outlet to 7000 a day. Some of the other fields also will have substantial reserves, although others may be of minor importance. A gross producing interval of 500 feet was demonstrated in one well near Glendive, Montana.

Outlook for Increased Tubular Goods Supply in 1953-54 Improves

Following the shortages of tubular goods of recent years, the outlook for availability of needed pipe in 1953, 1954 and later years is comparatively cheerful. This is a conclusion that may be drawn from a paper on tubular goods supply and demand by R. C. Zell, Union Oil Company of California, Los Angeles. His paper was among those presented recently at Chicago at the annual meeting of the American Petroleum Institute.

Additional pipe making capacity is being provided by the steel industry. The new facilities will come into production during 1953, and they will result in some increase in annual output for 1953 and a further increase for 1954. The additional capacity for making tubular goods will help to meet the petroleum industry's requirements in the event there is a further expansion of drilling.

Further increases in the number of wells drilled annually are possible, as demand for petroleum products has continued to expand. However, there is considerable uncertainty at precent regarding the number of wells that the industry will want to drill in the next several years, and the outlook for pipe demand is much less clear than the prospects for pipe supply.

Eight companies currently are producing oil country tubular goods. The five seamless, two electric weld, and one lap weld mill have a maximum capacity under ideal conditions of approximately 1,850,000 tons annually. In addition, stated Zell, there will come into production during 1953 some additional seamless and electric weld production in sizes 2⅜ through 10¾ inches outside diameter, for which there is the greatest demand. This tonage could amount to 290,000 tons for 1953 if all mills go on production as scheduled.

Mills scheduled to be put in operation include one of 13,500 tons per month capacity to begin operating in the first quarter of 1953, one of 29,000 tons per month capacity in the second quarter, and a plant of 12,500 tons monthly capacity due to start operations late in the third quarter of 1953.

During 1954 and subsequent years the facilities added in 1953 could contribute 660,000 tons per year, provided the mills are operated to their rated maximum capacity on oil country tubular goods. Economics may dictate the manufacture of line pipe, mechanical pressure tubing, etc., in addition to oil country tubular goods. Under these conditions a minimum of 400,000 tons should be produced in these new mills.

In addition to the mills which will be put on production during 1953, several manufacturers are considering plans for additional facilities to manufacture oil country tubular goods, and it is to be expected that at least one of these mills will develop from the drawing board to an actuality during 1954.

Additional production can be obtained from existing facilities by modernization of blast furnaces and improvement of material handling equipment, thereby lessening down time on open hearth and blast furnace repairs, removal of production line bottlenecks — such as enlarging of blooming mill and round mill facilities —as well as improvement in threading, coupling and testing facilities.

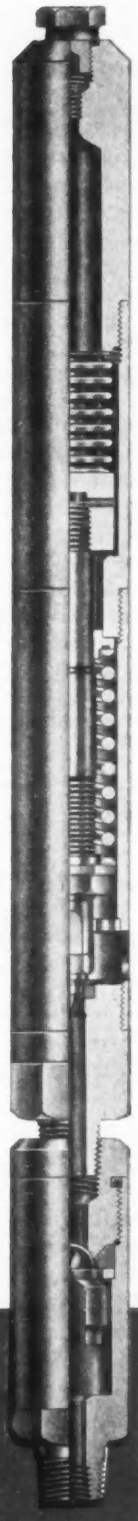
These improvements could add approximately 400,000 tons of tube making capacity. This capacity will be added gradually as improvements are made, but the first effects of this program should be felt during the fourth quarter of 1953 and during 1954.

In addition to production from domestic mills, the tubular goods supply will be augmented by production from foreign mills. They have a theoretical rated capacity of 450,000 tons, but are not fully integrated and depend on scrap, and actually have never reached full capacity operation.

A relatively small tonnage will be provided by utilizing used tubular goods and substituting line pipe in shallow wells.

Turning to the demand side of the tubular goods supply and demand outlook, Zell said he could not find any general disagreement with the drilling program of the Petroleum Administration for Defense for the latter half of 1952 (25,000 new wells) and the year 1953 (55,000 well completions). However, he added, PAD projected figures assuming continuation of the expanded program into 1954 and 1955, and "some people are quite skeptical and believe that the crystal ball became a bit cloudy when the figures for the years 1954 and 1955 were compiled."

Expectations of continuing need to carry on heavy volumes of drilling are predicated on continued increasing demand for oil, stated Zell. At no time during the past ten years has domestic production equaled the demand. Imports at an increasing amount have filled the gap between oil demand and domestic production. "Certainly," Zell concluded, "the trend for the future is for increased use of the products of petroleum," intimating that there should be also a continuing large demand for tubular goods, despite uncertainties as to the exact amounts to be needed.



Patent Number 2,465,060. Other patents applied for.

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3906 Completions Mark Reversal of Downtrend

By CECIL W. SMITH, WORLD OIL Staff

DRILLING CAME climbing back toward normal levels during October after several months of curtailment. The rate of completing wells had not entirely regained normalcy, but much improvement in the pipe supply situation was apparent.

The pinch brought about by the recent steel strike was first evident from August's drilling statistics, and apparently the full impact was experienced in September. Now with the past month's records showing considerable advance, the industry is getting back into high drilling gear.

The downward trend of well completion rates of August and September was reversed as the industry's drillers completed 3906 new wells during October. That was an increase of 417 new tests over the previous month's 3489, and 184 more than were finished in August, which is normally the most active drilling month of any year.

Despite the gain, October's activity could not match last year's comparable record. A year ago, 205 more wells were recorded than in the month just passed. However, last year saw drilling decline in the final two months, while this year the climb probably will continue in an effort to make up some of the setback.

With all the difficulties this year's drilling campaign has undergone, it still maintains a lead over last year's record-breaking activity. It certainly won't reach the 50,000-well mark that it appeared to be headed for early in the year, but at the end of 10 months it was at least hanging on to its lead over 1951. A total of 38,363 new wells have been completed so far, and that is a gain of 1352 wells or 3.7 percent over last year's. Including old wells deepened, the overall total drilled holds a lead of 3.1 percent.

In those wells, a grand total of 157,250,796 feet was drilled this year and that represented a gain of 14,207,486 feet or 9.9 percent over last year's 10-month footage score. To date, each new well completed has averaged 4088 feet deep, the deepest average in history, while at the same time in 1951 the average had been 3851, or 237 feet less.

Wells Completed in the United States During October, 1952, and First Ten Months, 1952

State or District	MONTHLY COMPLETIONS, OCTOBER, 1952 — NEW WELLS: Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water Disposal	Total New	Total Drilled Deeper	TOTAL COMPLETIONS: Oct. 1952	Sept. 1952	Oct. 1951	Footage Oct. 1952	CUMULATIVE TOTALS January-October: Wells 1952	Wells 1951	Percent Diff.	Footage 1952	Footage 1951	Rigs in Operation (Drilling, Rigging-Up and Shut Down): Oct. 31, 1952	Sept. 30, 1952	Oct. 31, 1951
Alabama	2			6				8		8	5	3	55,810	56	49	+ 14.3	338,600	238,019	6	5	4
Arizona				1				1		1			7,211	2	3	— 33.3	10,755	6,337	3	4	
Arkansas	12		3	35				50	1	51	40	42	213,016	359	354	+ 1.4	1,347,436	1,232,683	36	41	37
California	143		5	49				197		197	190	255	851,138	2,115	2,059	+ 2.7	8,789,404	7,929,356	242	261	271
Colorado	18		4	39				61		61	46	33	308,036	392	225	+ 74.2	2,091,525	1,088,740	49	42	44
Florida				1				1		1			6,326	7	3	+133.3	45,407	14,614	2	1	1
Georgia																			1	1	
Idaho															1	—100.0		12,844	3	3	1
Illinois	75			122				197		197	188	232	522,024	1,707	1,998	— 14.6	4,239,607	4,958,997	201	190	201
Indiana	27		3	80				110		110	98	158	198,817	1,069	1,110	— 3.7	1,835,123	2,010,041	162	157	182
Kansas	182		28	180			2	392		392	314	366	1,364,992	3,589	3,480	+ 3.1	12,452,493	11,909,927	410	403	434
Kentucky	37		16	47				100		100	112	123	196,806	985	1,089	— 9.6	2,009,480	2,228,186	102	90	103
Louisiana	119	10	24	98	1			252		252	207	192	1,657,517	1,989	1,850	+ 7.5	13,159,974	11,737,917	225	218	253
North Louisiana	70	3	9	60	1			143		143	123	101	614,577	1,098	1,022	+ 7.4	4,232,662	3,887,946	61	70	78
South Louisiana	49	7	15	38				109		109	84	91	1,042,940	891	828	+ 7.6	8,963,312	7,849,971	164	148	175
Maryland											3	4		32	30	+ 6.7	124,967	126,313	6	11	31
Michigan	17		4	33				54		54	42	63	145,260	545	595	— 8.4	1,467,191	1,489,727	90	89	122
Mississippi	9	1	1	14				25		25	23	39	179,953	284	312	— 9.0	2,037,035	2,063,486	37	37	38
Missouri											4			30	4	+650.0	30,192	2,717	3	3	5
Montana	19		1	27				47		47	39	35	211,797	247	235	+ 5.1	859,270	543,261	66	68	39
Nebraska	12		1	26				39		39	31	26	182,584	213	145	+ 46.9	1,060,887	691,478	18	17	18
Nevada															2	—100.0		15,431	1	1	1
New Mexico	37		32	22				91		91	98	70	482,190	930	580	+ 60.3	5,132,462	2,864,363	180	173	187
New York	61				38			99		99	112	42	136,673	906	443	+104.5	1,257,430	633,223	121	127	54
North Dakota	11			7				18		18	9	1	148,008	60	8	+650.0	523,968	40,275	29	30	6
Ohio	44		23	36				103	2	105	71	94	215,601	819	771	+ 6.2	1,752,753	1,558,764	171	171	156
Oklahoma	252	1	27	178	6		2	466	12	478	402	552	1,731,492	4,843	4,719	+ 2.6	17,887,375	16,857,908	561	574	649
Pennsylvania	53		22	7	48	8		138	2	140	152	158	238,291	1,426	1,297	+ 9.9	2,409,297	2,227,351	246	277	244
South Dakota				2				2		2	1		4,310	5			20,531		1	1	3
Tennessee															6	—100.0		7,465	5	5	7
Texas	678	20	37	589	8			1,332	18	1,350	1,239	1,513	6,012,990	15,127	15,082	+ 0.3	71,691,046	65,681,508	1,381	1,363	1,835
Dist. 1 S. Central	37	2		59				98		98	87	44	283,781	664	511	+ 29.9	1,950,520	1,419,217	46	42	51
Dist. 2 Middle Gulf	28	3	4	36	1			72		72	49	56	439,420	687	638	+ 7.7	4,364,592	3,747,686	46	49	78
Dist. 3 Upper Gulf	49	9	9	59				126	3	129	164	127	750,822	1,498	1,290	+ 16.1	9,782,046	8,031,105	142	134	124
Dist. 4 L. Gulf-S.W.	50	2	12	57				121		121	101	121	600,796	1,366	1,423	— 4.0	7,196,645	6,987,826	122	92	119
Dist. 5 E. Central	7		1	20	1			29		29	31	36	123,331	304	404	— 24.8	1,513,448	1,652,103	20	19	30
Dist. 6 Northeast	12	2	2	14				30		30	33	53	176,993	443	587	— 24.5	2,719,935	3,007,378	43	36	43
Dist. 7-B N. Cent.	92			120				212		212	191	211	630,124	2,298	2,365	— 2.8	7,226,327	6,871,780	116	137	186
Dist. 7-C W. Cent.	111	1		45				157	3	160	128	141	944,664	1,806	1,239	+ 45.8	10,516,812	5,717,820	162	178	253
Dist. 8 West	141	1		52				194	12	206	199	340	1,084,347	2,896	3,362	— 13.9	16,221,106	18,345,236	343	303	558
Dist. 9 North	140		5	125	6			276		276	228	325	923,829	2,673	2,500	+ 6.9	8,624,588	7,471,604	266	299	269
Dist. 10 Panhandle	11		4	2				17		17	28	59	54,883	492	763	— 35.5	1,575,027	2,429,753	75	74	124
Utah	1		1	7				9		9	11	2	52,197	66	27	+144.4	419,862	127,021	27	26	29
Virginia																					1
Washington																					1
West Virginia	5		27	9				41		41	40	90	123,530	487	535	— 9.0	1,447,339	1,524,692	185	204	205
Wyoming	39		2	32				73		73	42	77	364,298	539	646	— 16.6	2,713,387	3,220,666	89	94	98
Total U.S.	1,853	32	261	1,647	101	8	4	3,906	35	3,941	3,519	4,170	15,610,867	38,829	37,658	+ 3.1	157,250,796	143,043,310	4,659	4,687	5,260

What Is Oil's Role In the MSA Program?

'. . . a vital part in ERP . . . reflecting the high importance of petroleum both in peacetime economic development and in defense.'

The role played by the petroleum industry in the European Recovery Program through Economic Cooperation Administration and its successor, Mutual Security Agency, was highlighted by the recent suit filed by the U. S. Justice Department in New York Federal Court alleging overcharges on some shipments of petroleum to ECA/MSA participating nations. To get a full understanding of the importance of petroleum to the Mutual Security Program, the editors of WORLD OIL interviewed Cornelius J. Dwyer, Chief of the Petroleum and Petroleum Equipment Branch, Mutual Security Agency in Washington.

Cornelius J. Dwyer

Q. Mr. Dwyer, briefly what are the broad objectives of the Mutual Security Program?

A. The broad objectives of the U. S. in the Mutual Security Program are to bolster the defensive strength of friendly nations abroad against the threat of Soviet aggression. It is not a program of charity. It is a program of self-preservation for civilization through unified strength.

There are three general parts to the program: Direct military aid, defense support and economic and technical assistance to underdeveloped areas. Under the military part of the program, which receives the bulk of the program funds, the Defense Department provides the armed forces of participating nations with finished "fighting hardware" where it is most needed. A much smaller part of the money is used by Mutual Security Agency for defense support—that is, to finance the purchase by friendly countries of commodities, machinery, equipment and so forth, which they must have in order to produce military items themselves. The third part is the Point Four Program, under the State Department's Technical Cooperation Administration (TCA). In the areas where this agency operates—the Near East, Africa, Latin America and Asia —mutual security is more than a military problem, requiring economic stability to resist Communist imperialism.

Q. When did this program first start under MSA's predecessor, the Economic Cooperation Administration?

A. While MSA was not officially established until Dec. 31, 1951, the character of ECA's program in Europe gradually changed after outbreak of the Korean War. Up to that time, ECA's principal objective in administering the Marshall Plan had been to help European nations to get back on their feet after the destruction of World War II. This meant financing with dollars the goods and equipment needed by these countries to rebuild industrial and agricultural production. After Korea, the program's emphasis was shifted to the present defense-supporting type operations. The direct military aid part of the present program also had its predecessor, called Mutual Defense Assistance Program (MDAP), which operated from 1950 until it became part of the Mutual Security Program.

Q. What role have petroleum and petroleum equipment industries played in the ECA/MSA programs?

A. Petroleum and petroleum equipment industries have played a vital part in the European Recovery Program, Point Four assistance to underdeveloped nations, and the Mutual Security Program, reflecting the high importance of petroleum both in peace time economic development and in defense.

During the 45 months of the European Recovery Program, ECA financed $11.4 billion worth of imports of all kinds into the participating countries. During this period, we estimate that the dollars spent by these same countries on petroleum account—crude oil and refined products, tanker freight, petroleum equipment, and the worldwide costs of British and British-Dutch oil companies—amounted to roughly $3.8 billion, a sum equal to more than one-third of the dollar aid advanced.

Although ECA financed only $1.4 billion of this total, it was necessary for the agency to concern itself with the policies involved in the expenditure of the total amount because of their importance to the success of the European Recovery Program and broader U. S. national interests.

Q. What European nations received aid on petroleum and petroleum equipment account under ECA/MSA programs?

A. All European nations receiving financial aid under the European Recovery Program have received aid on petroleum (See Table 1).

It is more difficult to answer the portion of the question relating to petroleum equipment because of the problem of defining it. All manner of items, including trucks, electrical equipment and so forth, are used in the overseas petroleum business and it is very hard to determine the ultimate end use of imports of items in this category. (Even in a refinery, much

. . . a newspaperman turned diplomat

CORNELIUS J. DWYER has been closely associated with petroleum and foreign affairs of the U. S. for the past six years. He entered the diplomatic service July 5, 1946, as a foreign service officer assigned to the American Embassy in London as third secretary. From February, 1947, to mid-1949 he was Petroleum Attache, American Embassy, London; and after establishment of ECA in April, 1948, was Petroleum Officer for the ECA mission in London.

Dwyer was appointed Deputy Chief, Petroleum Branch of ECA in July, 1949, and a year later was named chief of ECA's Central Europe Branch. From June 1951 until January 1952, he was in charge of the Petroleum Section of the President's Materials Policy Commission (Paley Commission), and since the start of 1952 has been in his present position. A native of New Rochelle, N. Y., born in 1917, Dwyer graduated from Yale University in 1939 and prior to World War II was a reporter and editor, first for United Press and later the Associated Press in Cleveland, New York and Kansas City. He covered oil news in the latter city. Prior to entering the Diplomatic Service, he served in the U. S. Army Air Force, and held the rank of captain.

of the dollar cost consists of unspecialized steel structural shapes which do not show up in either export or import statistics as being destined for petroleum projects.) ECA, therefore, decided quite early in its operations that it would be neither feasible nor particularly important to attempt to determine exactly how much of the items financed by us eventually were used in some sector of the petroleum industry.

We decided to concentrate on projects, which were defined as involving the expenditure of more than $250,000 for dollar items and on specialized petroleum items, such as well-drilling equipment. All projects had to be approved, not only by the country concerned, but also the ECA Mission in that country, and the Oil Committee of the Organization for European Economic Cooperation (OEEC) in Paris, as well as ECA in Washington. In addition, in the case of crude production and exploration projects, the services of geologists were obtained to check the probability of oil findings prior to approval of these projects.

Austria, France, Germany, Italy and United Kingdom are the countries which have had petroleum projects financed by ECA.

Since Korea, MSA also has acted as claimant agent for the participating countries and their overseas territories and in this capacity has assisted the petroleum industry operating in that area to obtain U. S. materials and equipment under control here or requiring supply assistance. Petroleum, which is so vital to defense and defense-supporting industries, was considered a special category among the area responsibilities of the agency and a separate interagency clearance channel was established for petroleum and petroleum materials and equipment.

As of this date, 2 production projects, 61 refinery projects and 9 transportation projects involving a total materials and equipment cost of $427 million have been approved for the MSA area through this interagency channel. All these projects had not only to be incorporated into the MSA area program, but also into world supply programs of the Petroleum Administration for Defense. For the calendar year 1952 a total of 135,813 tons of carbon steel were allocated to the foreign petroleum industry operating in the MSA area.

MSA also has assisted foreign operators outside Western Europe to obtain greater quantities of material and equipment manufactured in that area. (This effort serves not only the short-term purpose of securing materials during the present materials shortage, but also the long-term purpose of reducing the dollar gap for the participating countries on oil account.)

TABLE 1

Foreign and Allotments for Crude and Refined Products Procurement and Petroleum Industrial Projects

(THOUSANDS OF DOLLARS)

Participating Nations	Procurement Authorizations Issued[1]	Projects[2]	Total
Belgium-Luxembourg	$ 59,866	$	$ 59,866
Denmark	56,103	....	56,103
France	389,600	20,265	409,865
Germany	54,502	670	55,172
Italy and Trieste	141,749	8,134	149,883
Netherlands	64,809	....	64,809
Sweden	66,221	....	66,221
United Kingdom	331,107	9,705	340,812
Other European	92,348	470	92,818
Total	1,256,305	39,244	1,295,549

[1] F.O.B. value, excludes ocean freight.

[2] Includes the total ECA/MSA dollar financing approved for completion of projects.

Q. What have been the total dollar outlays for petroleum and petroleum equipment and what part of this has been financed for ECA/MSA? Is the money spent by ECA/MSA in this connection abroad in the form of a loan or a gift to the assisted European countries?

A. During the period of ECA's existence (April 1948-December 1951) the European nations spent $2.1 billion on purchases of oil from American companies. ECA financed $1.2 billion, or 56 percent, of the American company oil and 26 percent of the total imports. During the period January-July, 1952, MSA expended a further $136 million for European petroleum products.

We calculated that these same countries imported petroleum equipment from the U. S. amounting to $250 million during the ECA period. A total of $26.9 million, or 11 percent, of these imports was financed under the ECA programs.

Most of the aid extended to Europe has been in the form of grants to the participating countries, but part of the assistance to all countries, except Austria and Greece, was in the form of loans. The aid extended in some cases carried the condition that the country grant an equivalent amount in their own currencies to other countries. All of the aid extended to Sweden and most of that to Belgium came under these arrangements. Every country except Greece and Ireland received part of their aid under such provisions.

The type of assistance extended to the foreign nation does not affect in any way its expenditures on particular commodities. In all cases, of course, the private company receiving the oil or equipment has to buy the ECA dollars with local currencies and thus receives no grants from the U. S. government to assist it in meeting its capital requirements.

Q. What has been the total cost of crude petroleum and refined products and the volume of same supplied the participating countries from all sources, dollar and other? Was any of the non-dollar oil financed with ECA/MSA funds?

A. Total imports of crude oil and petroleum products into the European nations participating in the Recovery Program amounted to 1,603.9 million barrels valued at $4,606.2 million. In the early days of the program, ECA financed $1.3 million worth of non-dollar oil from the Middle East moving to Europe. This amounted to one-

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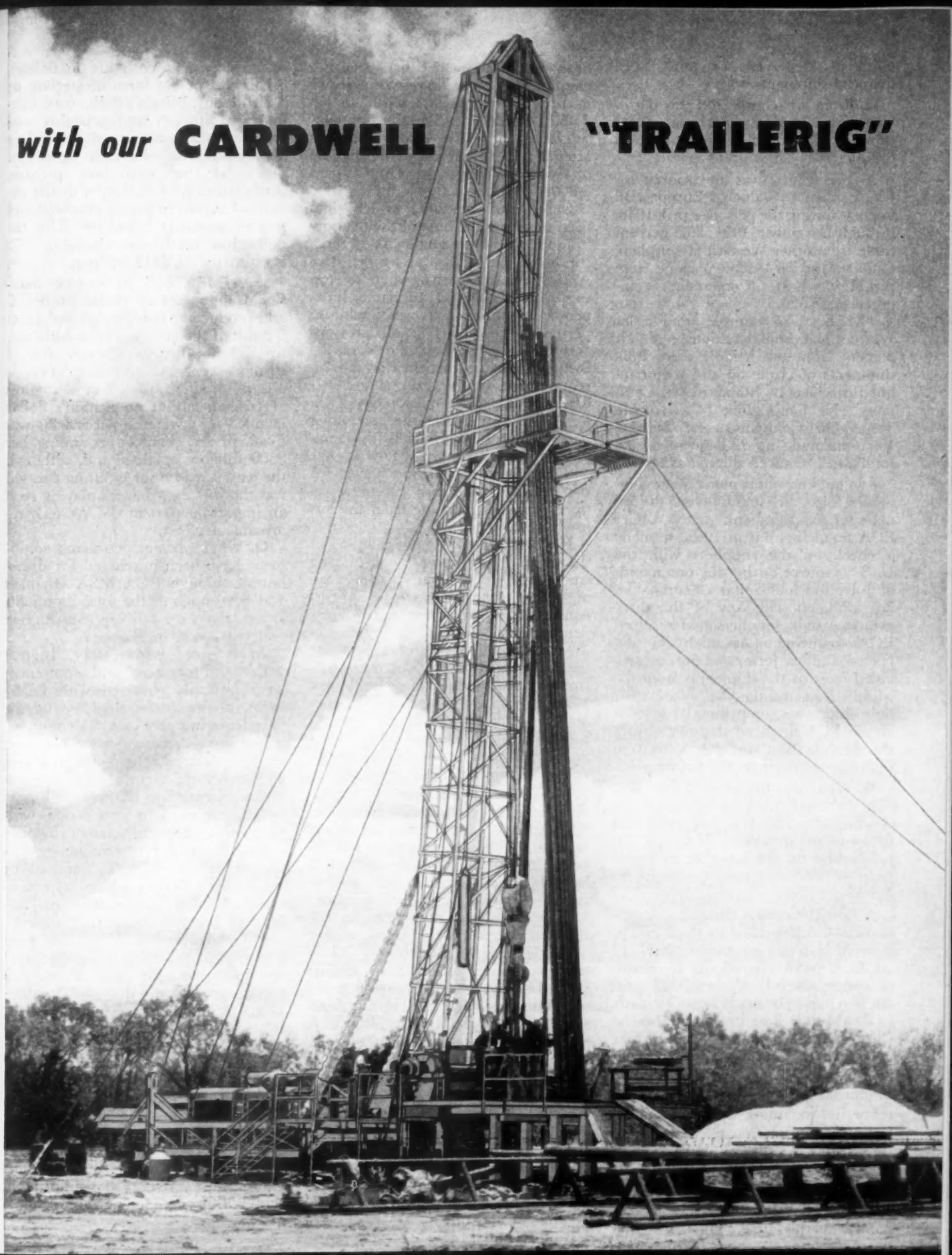

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tenth of 1 percent of total ECA financed shipments.

Q. From what areas did this petroleum come? What oil companies supplied the crude petroleum and products?

A. The U. S. was the source for 12.3 percent by value of Europe's oil imports during the period, April, 1948, through December, 1951; 29.3 percent came from other Western Hemisphere nations; and 58.4 percent came from the Middle East. Of dollar source imports alone, 26.5 percent came from the U. S.; 36.4 percent from other Western Hemisphere nations; and 37.1 percent from the Middle East. Bulk shipments of crude oil and major refined products by Standard Oil Company (N. J.), Caltex (California Texas Oil Company) and Socony-Vacuum made up 72 percent of the total ECA financed shipments.

I do not know how many other companies took part in supplying the remainder of shipments made under ECA financing, but in 1949 we made a check on the suppliers with the U. S. as source during the one month of July, and found that 72 companies not affiliated with any of the three principal bulk suppliers had received ECA financing. (As might be expected, Caltex, Jersey and Socony provided most of the shipments from the Middle East and the Caribbean; their bulk shipments comprising 95 percent of the ECA financed shipments from the Middle East and 82 percent of such shipments from the Caribbean.)

Q. What was the effect of the Iranian nationalization of the properties of Anglo-Iranian Oil Company and the resultant shut-down of Iranian oil production on the program of European petroleum supply under ECA/MSA?

A. The nationalization of the Anglo-Iranian Oil Company by the Government of Iran had a considerable effect on ECA/MSA operations. It meant, of course, that Iran's crude oil production had to be made up, principally in the Middle East itself, but also the Caribbean and the U. S., and that output of the world's largest refinery at Abadan also had to be replaced insofar as possible. Most free world refineries, including those in Europe, ran above optimum capacity until the shortage in most products began to ease. The new refinery capacity in Europe, developed under the European Recovery Program, came in very handy at this time. The increasing flow of Middle Eastern oil to the U. S. was cut down and the oil diverted to European refineries, while product exports from the U. S. and the Caribbean to Europe, which had been declining, rose. Since marginal increases in supply were in dollars, this increased dollar oil movements to Europe considerably during the first 12 months after the shutdown, about the middle of 1951. However, most of the impact fell upon Britain.

Continental nations, which had been receiving the bulk of their supply from the British companies for sterling, continued to do so although the Anglo-Iranian Company had to stop supplying crude oil to some independent refineries and was unable to provide residual oil to all previous customers. By and large, however, the British companies met their customers' requirements both in Europe and elsewhere in the world by purchasing oil for dollars from American companies and reselling for sterling. British company crude oil supply is now in line with requirements, having regard for the decrease in British company refinery capacity resulting from the loss of Abadan.

In the month of September, 1951, the British companies were making emergency product purchases averaging 300,000 barrels daily at a cost equivalent to an annual rate of expenditure of $365 million. It becomes progressively more difficult to separate these emergency product purchases from normal product purchases by the British companies which, of course, are a regular feature of the international petroleum trade, but it is estimated that these emergency purchases will be eliminated early in 1953.

However, British product availability will not yet be high enough to take care of traditional wholesale sales to U. S. companies and independents. Furthermore, the continued loss of Abadan's aviation gasoline capacity, which was equal to about 40 percent of avgas capacity in the free world outside the U. S., means not only that the British will fail to earn currencies other than dollars from the sale of a high valued product, but also that free world avgas availability, as clearly illustrated during last spring's oil strike in the U. S., is too close to the margin for comfort.

The total current cost to the British of the loss of Iran includes not only the costs of purchasing crude oil and products from dollar sources but also the cost of diverting tankers from their normal runs and of expanding crude oil production and refinery runs elsewhere, and the lost sales to American companies and others. There are offsetting savings, however, including the cost of operation in Iran, which involved a substantial dollar element arising from the conversion of royalties and other sterling payments. Some of these current costs are in dollars, others are in the form of sterling or EPU credits. Britain's dollar costs arising from this loss were probably running at an annual rate of more than $500 million in the high month of September, but have been progressively reduced since then with the expanded output of British crude oil and refined products elsewhere. The net dollar loss for the calendar year 1952 is estimated at $215 million.

ECA/MSA had to finance additional shipments of dollar crude oil and products to continental nations as a result of the Iranian crisis. Although we did not finance directly any of Britian's emergency purchases of crude oil and products, the effect of the loss of Iranian output on Britain's dollar balance of payments necessarily was taken into account in extending her $300 million worth of aid, although the actual reason for granting this aid was the fact that she was playing such an important part in the Western rearmament effort.

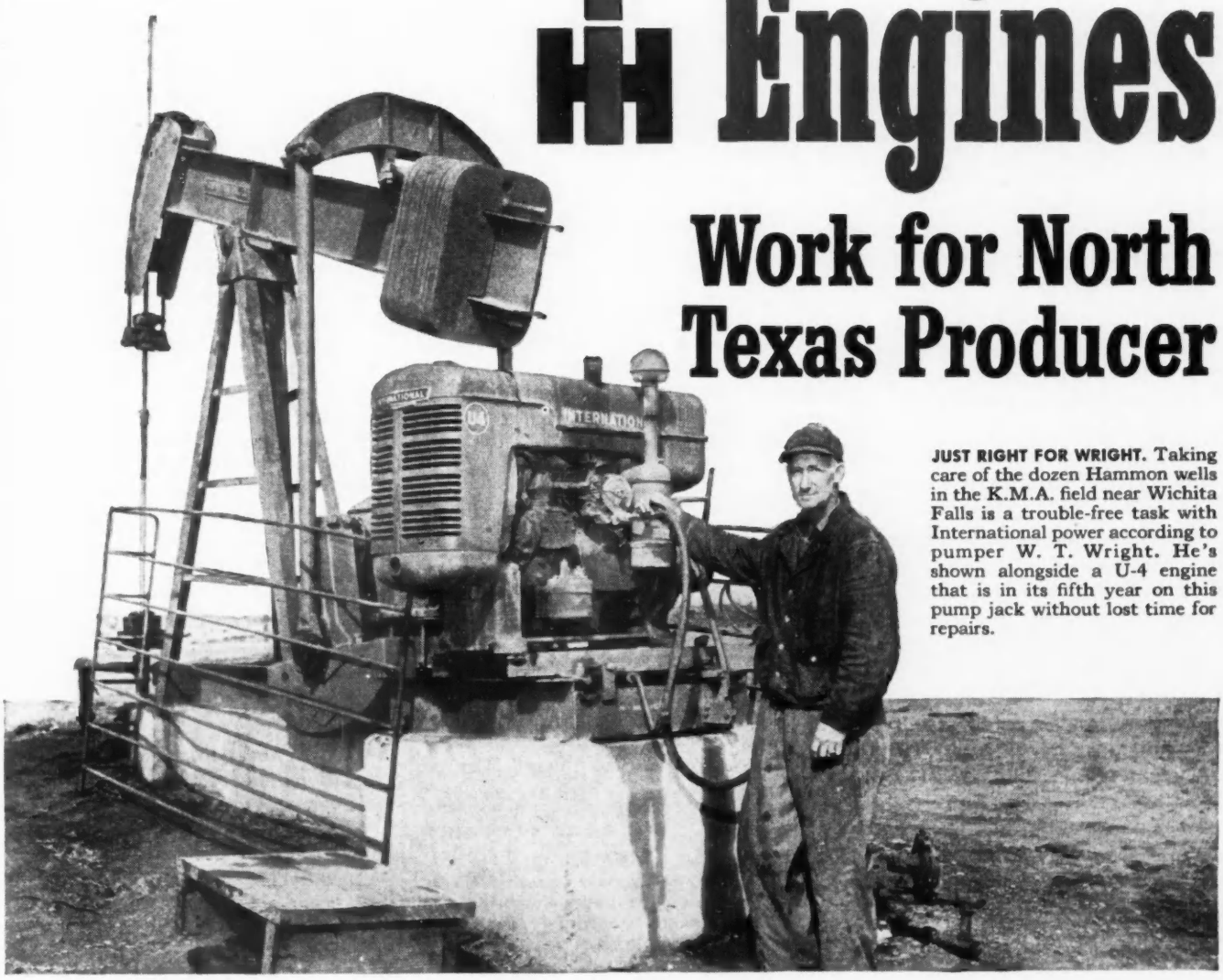
Q. What types of petroleum equipment have been purchased for distribution through ECA/MSA channels and how much of the total represents expenditures for refinery construction and expansion in Europe?

A. As noted previously, a great variety of materials and equipment were probably obtained with ECA/MSA, assistance for final use by the petroleum industry in MSA countries. These items, however, were obtained through normal commercial channels and under no circumstances were grants extended to the foreign buyers by this agency. In connection with petroleum expansion programs, we agreed to finance $36 million for refinery projects and $3.3 million for oil well drilling projects. Approximately $20.8 million of this total earmarked for petroleum projects represents financing of U. S. materials and equipment; the remainder met the dollar costs for U. S. engineering services and other know-how. In addition, we financed $5.6 million for items specifically designated for maintenance, repair and operations in the European petroleum industry. Other items which we financed may eventually have become petroleum industry end-use items but it is not possible to get a statistical accounting of their magnitude.

Q. What part of the total spent for equipment represents expenditures in the U. S. for equipment and technical "know-how"?

A. All of the ECA/MSA dollars spent in connection with the European expansion of crude oil production, refining and transportation facilities involved payments for U. S.

83 Trouble-Free IH Engines Work for North Texas Producer



JUST RIGHT FOR WRIGHT. Taking care of the dozen Hammon wells in the K.M.A. field near Wichita Falls is a trouble-free task with International power according to pumper W. T. Wright. He's shown alongside a U-4 engine that is in its fifth year on this pump jack without lost time for repairs.

"I can depend on Internationals to run and run without major repairs," says pumper. W. H. Hammon, Wichita Falls, independent oil producer, uses 83 International pumping engines on his wells.

Pumper W. T. Wright gives the low-down:

"I can depend on our U-1s, U-2s, U-4s, U-6s and even the old P-12s to run and run without major repairs. Many of the International engines have operated 18 to 24 hours a day for more than four years without overhaul . . . and they sure don't have a bit of trouble pulling the load."

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materials and equipment, for services rendered by U. S. engineering companies, and for royalties covering U. S.-owned processes. Approximately half of the assistance rendered by the agency to European petroleum projects covered materials and equipment, the other half took care of payments to U. S. engineering companies and royalties.

The total cost of the European refinery expansion program in all currencies for completion of the program is estimated to amount to $1018 million. The fact that dollar expenditures are only 17 percent of this total is an indication of the great progress which has been made in developing the European equipment industry during the life of the European Recovery Program. As a matter of fact, current estimates of dollar expenditures on equipment and know-how are nearly 20 percent below the original U. S. Government estimate made in the fall of 1947. This is a striking decrease, not only because equipment prices have gone up considerably since then, but also because the new capacity actually constructed was two and one-half times as large as the original refinery expansion program.

In addition to these expenditures for petroleum industry expansion in Europe, ECA/MSA "exported" U. S. petroleum industry "know-how" via the productivity and technical assistance programs. These "exports" were the natural follow-up to the MSA supported European petroleum expansion program. Since the beginning of the technical assistance drive ECA/MSA has spent $110,813 in sponsoring 10 technical assistance projects for the European petroleum industry. Two of the 10 projects were type "B" projects in which U. S. experts were detailed to go to a European country to assist in the training of industry personnel. The remaining 8 projects were type "A" projects which authorized European personnel to come to the U. S. to study modern oil refining, gas and oil drilling, production methods and the distribution and marketing of oil products.

Training of European personnel in the U. S. was made possible by an integrated program which used the facilities of private industry, public and private universities and governmental development and research laboratories. A total of 87 persons have been afforded the opportunity to spend 1207 man-weeks in the U. S. for in-plant training, research or university study. ECA/MSA sent four experts abroad under type "B" program. By the end of their contract period, the four experts will have spent a total of 92 man-weeks in Europe advising and instructing a number of industry personnel.

Q. Under the existing programs of ECA/MSA what are the goals for refinery capacity expansion in the various European nations? What part of the goal in each country has been completed in the way of installed capacity?

A. The 1954 goal of the current refinery expansion programs in the various European nations as compared to capacity in 1938, 1948 and 1952 is shown in Table 2.

Q. In your opinion how much longer will MSA assistance to European nations for petroleum equipment alone be necessary?

A. MSA is still financing petroleum equipment required for projects approved during the period of the European Recovery Program. As noted earlier, the aid now going to Europe is for purchases assisting the European defense effort. Nearly all economic petroleum projects would meet this definition quite as well as ordnance industries and if European nations request further financing of this type and the project meets the usual tests, we will undoubtedly consider their requests favorably. Thus, the answer to your question is that the financing of petroleum equipment will be justifiable as long as the overall Mutual Security Program is itself necessary.

TABLE 2

Refinery Throughput Capacity in European Participating Countries

(THOUSANDS OF BARRELS DAILY)

COUNTRY	1938	1948	1952	Final Capacity
Belgium-Luxembourg	12	9	58	85
Denmark	*	1	1	1
France	160	199	433	433
Germany	56	17	129	190
Greece	....	....	....	....
Iceland	....	....	....	....
Ireland	....	....	....	....
Italy and Trieste	30	68	200	251
Netherlands	15	52	156	196
Norway	1	....	1	1
Portugal	....	6	8	17
Sweden	1	11	35	35
Switzerland	....	2	2	4
Turkey	....	....	....	5
United Kingdom	94	110	475	560
Total	369	475	1,498	1,778

* Less than 1,000 barrels daily.

The above figures represent average yearly capacity based on conventional crude distillation procedure. Actual crude throughput was substantially lower than capacity in 1938 while in 1952 and future years, refiners may process more than their distillation capacity by using, for example, catalytic cracking units for the processing of crude oil, should circumstances require such procedure. For instance, the O.E.E.C. now estimates that actual crude run in 1954 will amount to 1,885,000 bpd. by making use of the cracking units.

Q. Last June, MSA suspended further financing of shipments of non-specialty type crude oils to European nations. Since the non-specialty crudes constitute the greatest bulk of the shipments to ECA/MSA nations what were the reasons for this action?

A. While it is true that non-specialty crudes constitute the greatest bulk of European oil imports payable in dollars, I should point out that these imports are estimated to amount to only 37 percent by value of total dollar imports for fiscal 1953, although the proportion of crude oil imports to the total has been rising steadily since 1948. W. John Kenney, Deputy Director of MSA, explained the reasons why MSA suspended the financing of this type of crude oil in a letter dated July 30, 1952, to Sen. Thomas C. Hennings, Jr., as follows:

"I have for some time been of the opinion that the American oil companies engaged in foreign trade should go as far as possible toward operating their business in the currencies of the importing countries. My position has been based in large part on the policy set forth in Section 112 (a) (3) of the Economic Cooperation Act of 1948, as amended, which provides that this agency should 'minimize the burden on the American taxpayer by reducing the amount of dollar purchases by the participating countries to the greatest extent possible.' I have fully recognized that progress toward this goal depends upon the ability of European countries to supply the oil companies with the types of goods and services needed by them in their international operations. There has been consistent improvement in the availability of these supplies and services in European countries since the start of the Marshall Plan and it was my conclusion, after giving consideration to the other two factors discussed below, that the time was ripe to discontinue MSA financing of non-specialty crude oils.

"Another factor which contributed to the decision to stop financing by this agency of crude oil supplies was the indication from the Congress during the spring of this year that MSA appropriations would be severely cut. The reductions in appropriations made it clear that we could no longer afford to continue the policy of financing offshore crude oil.

"The third factor which led to this decision was this agency's dissatisfaction with the prices charged by the oil companies for crude oil shipments and our belief that such prices were in excess of those permitted under our regulations."

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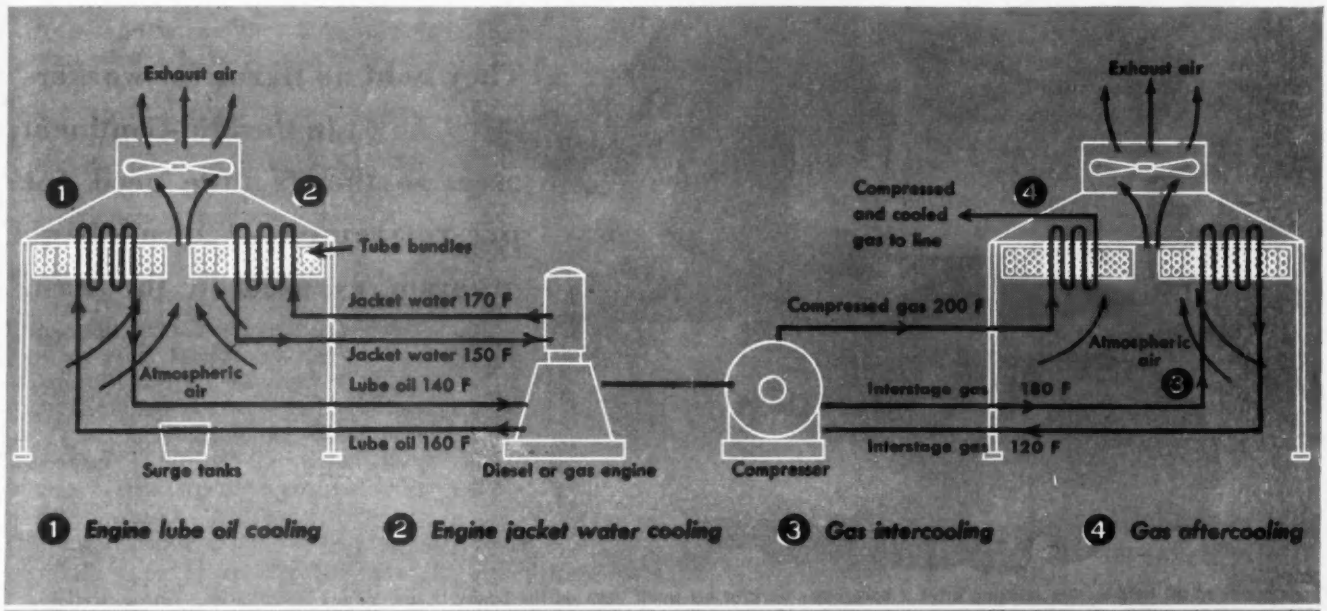

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Rocking Chair Blues?

Here's a retired oil field worker relaxing after a hard day's work at his small farm on the banks of the Illinois River. He planned it this way several years before he retired.

They hold no terror for workers in the Mid-Continent area, so there's little need for pre-retirement counselling program as used in the East.

By ANTHONY GIBBON
WORLD OIL Staff

ON A LEASE in Southern Oklahoma, drinking coffee in the pumper's tool house and watching the walking beams lazily going up and down, the talk got around to retirement. The pumper, a grizzled veteran of more than 30 years in the oil fields, was due for retirement in a couple of years. He'd knocked around oil wells most of his working days. What would happen to him when he finally stowed away his grease can, stacked his wrenches and said goodbye to the oil business?

Would he miss the old grind when he retired? Was he afraid of the old armchair? Had he made any plans? What had his company done to prepare him for retirement?

The pumper paused, looked surprised at these questions.

"Afraid of retirement?" he snorted. "Of course I ain't afraid of retiring. Sure, I'll miss the work but I'm looking forward to taking it easy for awhile. Armchair? I won't have time to sit in one when I get out to the farm. No siree! I guess I'll probably work harder than I'm working now, running herd on a bunch of pumping oil wells. And say, what gave you the idea that the company is 'preparing' me for retirement? If you mean my pension, sure. But as to telling me what I'm to do. No siree! I've had that one figured out for the past ten years."

Half an hour and half a pot of black coffee later, and after listening to farming lingo which sounded a bit strange coming from a man who had always used the jargon of the oil patch, the conversation ended.

But the conversation provoked some thought on retirement of oil workers. Like death and taxes, it catches up with the rank and file—those men who have spent a working lifetime with one or two established oil companies. A special counselling program was initiated some time ago by a major oil company designed to "pre-condition" employes some years before retirement. The program has clicked and company officials are enthusiastic with the results. They point with pride to happy annuitants who have benefited substantially from pre-retirement counselling.

A check discloses that the program was designed primarily for refinery workers in the east. Is such a program being carried out in the Mid-Continent area?

"Yes, we know of such a program," said a company official in Tulsa, "and it is a fine thing. But, we find it is not practical in this part of the country. Now, here are the reasons.

"In the first place, take our com-

pany. We operate over a wide area and have over 2000 employes. About 20 or 30 come up for retirement each year. If we had a "pre-conditioning" program such as you have described, we'd have to call in our prospective retirees from all operational areas to give them advice on what they can do when they retire.

"I can see how the program will work in, say, an area back east, where men are employed in the large refineries and where they live in congested areas. Take a man who has worked for some 40 years in such an environment. He gets up in the morning, packs his lunch pail, walks or drives to the refinery, works his eight hours behind the refinery fence and then punches the time clock, goes home and settles down for the evening.

"Let us not forget," he continued, "that this worker is living in a metropolitan area. Even if he has a car, it is quite a project for him to get out into the open country. After a hard day's work he hasn't the time nor inclination to drive the many miles through city streets to get out to see green pastures, fields and meadows. His interests are urban.

"This type of worker has a real problem upon retirement. For him the counselling by men experienced in this problem is invaluable. For, as I can well imagine, if left on his own with nothing to do but sit around the house, he becomes a burden to himself, perhaps even to his own family, and in no time at all he becomes a prey to the 'rockin' chair' blues."

Now, this is not intended to make the thousands of refinery employes who work in and around New York and Philadelphia and Chicago dissatisfied and lure them away from their interesting occupations to the more rugged jobs such as roustabouts, crewmen, pumpers and the other avocations of the oil patch.

It is intended, rather, to show, first, why a "pre-conditioning" program for prospective annuitants who live in the areas of oil production is unnecessary, and, second, to tell briefly what the prospective annuitant who works far from the metropolitan areas does to prepare himself for retirement.

The first proposition has been taken care of in the previous explanation by the company official.

Now, for the second proposition. The information was supplied by several personnel men in a number of major oil companies operating in the Greater Mid-Continent area. The same goes for workers who are located in the Rocky Mountain area and California and the Southwest.

Raising chickens and gardening is an absorbing and profitable occupation for many retired oil field workers. This ex-pumper bought his place several years before he retired. Pension checks plus profits from his small acreage assure comfort and security the rest of his days.

Generally, a few years before he is due to retire, the worker, whether in the field or the refinery, in, say, Texas or Oklahoma, looks around for a piece of property. Oklahomans favor small acreages or even small farms in Arkansas. The Ozarks area is a favorite spot and you'll meet lots of "grizzled pumpers" retired drillers, crewmen and others. They're not sitting in rockin' chairs, either. No siree! They are out in their garden patch raising fine vegetables, on a farm raising a crop, or a ranch raising beef or horses.

Near Sulphur, Okla., in the area made famous by ex-Governor Turner, the Oklahoma cowboy songwriter ("Hereford Heaven"), you'll find many retired oil field workers raising fine cattle.

Around Colorado you will come across them, fishing contentedly for rainbow trout in a clear mountain stream not far from a comfortable little house, which, like as not, he had built himself, five years before he received his first annuity check.

One driller in Oklahoma bought a small farm in Arkansas a couple of years before he retired and sent his wife to live there.

"If, after two years she likes farm life, I'll join her. If she doesn't like it, then I'll get a small acreage close to town and we'll be just as contented," he explained.

There's no corner on rugged individualism among oil patch workers but, as the personnel manager of one major company pointed out, prospective annuitants here do not care to be counselled on their retirement plans. After all, they have a wide choice of diversified interests to choose from.

In the wide open spaces, an annuitant's check, although it may be far less than the wage he received while working, goes much farther than it does in the city.

Retirement benefits, of course, vary with length of service but the average may be said to amount to between $80 and $120 a month. In the case of an annuitant who has worked 30 years and averaged a salary of $300 a month, he can expect to receive about $180 as long as he lives. The amounts vary, of course, in accordance with the company's pension plan, length of service, etc.

One worker who wished to retire at 50 (the usual retirement age is 65) and was satisfied to drastically discount his annuity, draws about $50 a month. He works a small farm in Arkansas and raises all he needs for himself and his wife and has enough stuff left over to go to market. The money he makes on the farm takes care of household and personal needs and leaves enough for diversionary activities such as hunting and fishing and an occasional trip to town. The $50 is gravy. Another annuitant who draws a comparable amount from his company, explained he was satisfied. "Just so's I have enough to pay the taxes on my place; the farm takes care of the rest," he explained.

Pre-retirement counselling?

No, that has not been found necessary for the oil patch worker. He has the good fortune to live in areas where conditions obtain which help him to decide for himself what he wants to do when his company working days are over.

To that man the old rockin' chair is just a piece of furniture which he uses to rest of an evening after the chores around the farm, the ranch or his small acreage just outside of town. It has no terrors for him.

Thank goodness for the wide open spaces!

Tugboat tows oil barge on San Bernard River to Phillips Petroleum Company's Sweeny, Texas, ref.nery.

Transportation Playing Big Role in Industry Operations

Adequate supplies assured in all parts of U. S. at prices within reach of millions.

By C. R. MUSGRAVE
Vice President Supply and Transportation,
Phillips Petroleum Company, Bartlesville, Okla.

OWNERSHIP AND OPERATION of transportation systems, developed by the petroleum industry to meet its own special needs and adaptable only to the movement of oil and its products, have insured adequate supplies of all grades of petroleum products in every section of the country at prices within the financial means of millions of consumers in every walk of life.

These vital arteries which are indispensable to the nation's existence and economy comprise the vast network of crude oil and products pipe lines, thousands of railroad tank cars and trucks, barges and tankers which convey quickly and economically from producer to consumer the life blood of the industrial age—oil and its products.

Not until a few years after the Drake well discovery in 1859 did the oil pipe line come into being, mothered by the necessity for an efficient and economical means of transporting the oil. Crude oil was first transported in barrels, but the problem of barrel supply and the high cost of this method of transportation encouraged producers to experiment with pipes or tubes in an effort to develop a more satisfactory and economical means of moving their crude oil to market.

The first interstate crude oil pipe line was completed from the Pennsylvania fields to the Atlantic Seaboard in 1879. Interstate products pipe lines were first placed in service in 1930; like crude oil lines, they were immediately successful. Thus the history of the modern pipe line is the history of oil. In the 90 years that have followed those early Pennsylvania days the nation's pipe line system has grown to its present stature without subsidy of any kind to aid its construction and operation. Well over $1 billion of private capital have been invested in the pipe line industry.

Today more than 140,000 miles of crude oil lines provide the connecting link between more than 450,000 producing oil wells in 26 states and most of the 374 active refineries in the nation. Twenty thousand miles of products lines efficiently and economically move an increasing flow of improved petroleum products from those refineries to distribution centers. Through these pipe lines move over 6 million barrels of crude and products per day—more than 12 percent of the nation's total domestic traffic transported by all common carriers in the U. S.

Certain unique and inherent characteristics set pipe line transportation apart from other carriers from an operating standpoint. The pipe line transports one commodity in one direction with no possibility of a backhaul; the commodity transported requires no packing or packaging; it moves the commodity by the direct application of power—pushing or impelling—rather than transporting; there is no empty equipment to deadhead back to origin; it has no vehicle or dunnage dead weight to move and, therefore, achieves a relatively high power efficiency. It cannot operate without a continuous large volume. The commodity it moves loses a substantial part of its value in storage, and tankage for storing the volumes

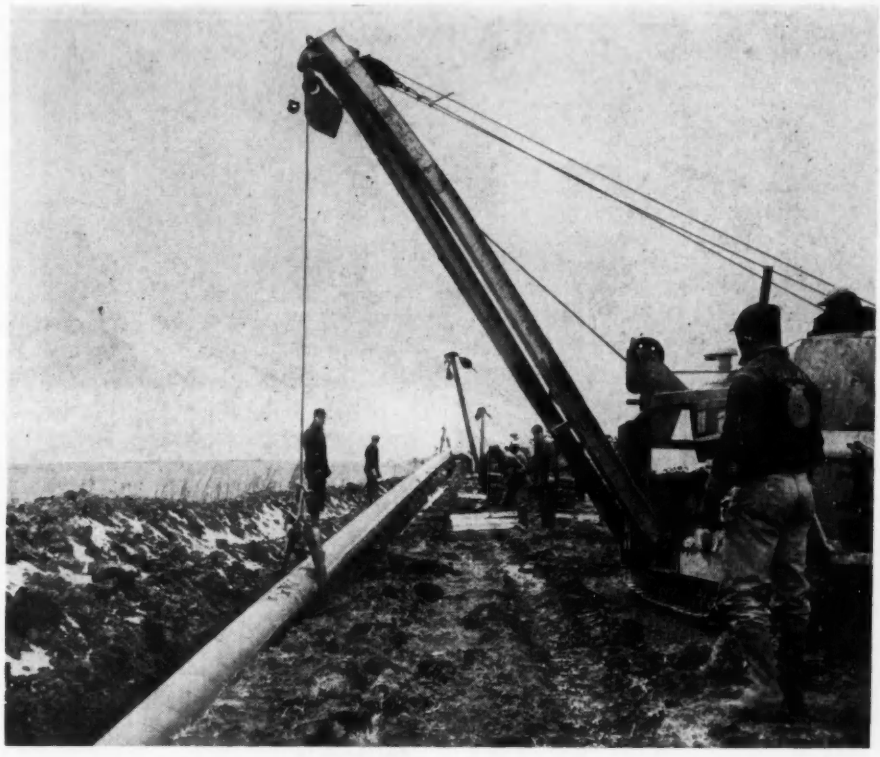
constantly moved by pipe lines would require major capital investment; thus, it is essential to the building and successful operation of pipe lines that there be continuous production at one end and continuous processing at the other.

The pipe line is as intimately related to the intricate producing and refining processes of the oil industry as the conveyor is to the automobile industry's assembly line. In one area the oil is produced; in another there is a demand for it as a refinery. The two are linked together by the pipe line—the natural form of transportation. The oil industry alone is sufficiently interested to invest its capital in welding this link, and thus we have the basic fact that the construction of any pipe line originates from a refinery need at destination and a supply of crude at origin. That is why all pipe lines now in petroleum service have been built solely through the investment of private oil industry capital, and it is also the reason for a more closely held ownership of pipe lines than is the case, generally, with other transportation agencies.

The Interstate Commerce Commission, in Reduced Pipe Line Rates and Gathering Charges, 243 ICC 130, found pipe lines to be superior to any other method of transport for the movement of oil. The Commission said:

> "The record shows that the reductions in rates which were the primary cause of this investigation were but the beginning of a continuing process which, as shown herein, has resulted in a decrease of more than 40 percent in the present rates below those which were in effect on Dec. 31, 1933. This is the more remarkable, as every other type of common carrier in the same period has been forced to make general increases in rates—often successive increases of material size—to cover their mounting costs of operation."

Crude oil pipe lines render a most important service to the producer. Probably the most outstanding one is that the pipe line provides the means for bringing the market for crude oil to the producer's lease. The purchaser buys and takes possession of the crude as it reaches the valve between the producer's tank and the pipe line, and the purchaser, rather than the producer, pays the transportation charge. This is practically without precedent in any other industry processing raw materials of the mine, forest, or soil. In such other industries the primary producer usually must seek his own market and pay the cost of transporting his commodity to it.



Pipe line construction job near Paola, Kan.

The assured outlet for his crude—the availability of pipe line transportation—has thus brought stability to the producer's end of the oil business. By frequent runs from the lease tanks into its gathering system, the pipe line minimizes tankage which the producer must have and enables him to convert his production into cash currently, instead of having to carry an investment in produced oil. Once connected to a lease during its flush production period, the pipe line will usually continue to run oil from it through its declining days until the lease is abandoned. This assured transportation keeps alive almost 300,000 stripper wells in the U. S., which represents 71 percent of the total producing wells.

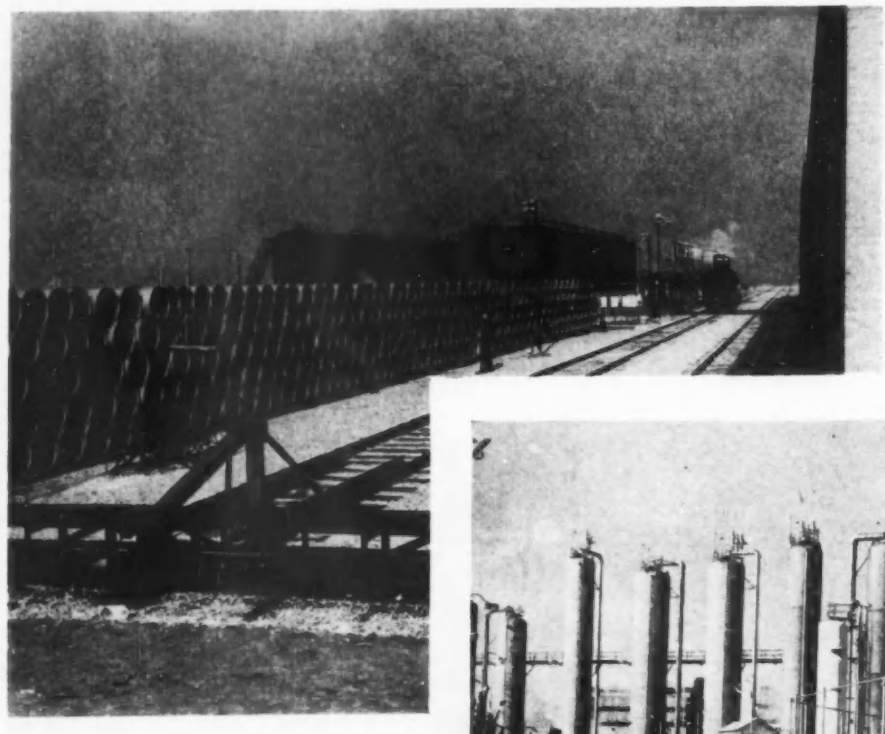
Products pipe lines extend the functions of crude oil gathering and trunk pipe line systems, enlarging the producers' marketing territory for crude and making products available to the consumer at minimum costs.

Pipe lines furnish a tremendous tonnage of their own pipe and materials for other carriers. When we consider the immense volume of tonnage moved by other branches of the oil industry via other carriers and realize that the instrumentality of the pipe line has made possible the vast and widespread growth of the oil industry, it must be recognized that the pipe line is not a competitor but is a promoter of traffic for other types of carriers.

In the early history of the oil industry refined petroleum products were shipped in barrels in boxcars, but as the traffic increased in volume, the cost of barrels and the expense of filling, loading and forwarding reached such proportions as to cause the industry to seek lower costs of wholesale distribution. The tank car of the present time is the result of this early effort, commenced in 1865, of the petroleum industry to reduce to the consumer the price of petroleum products.

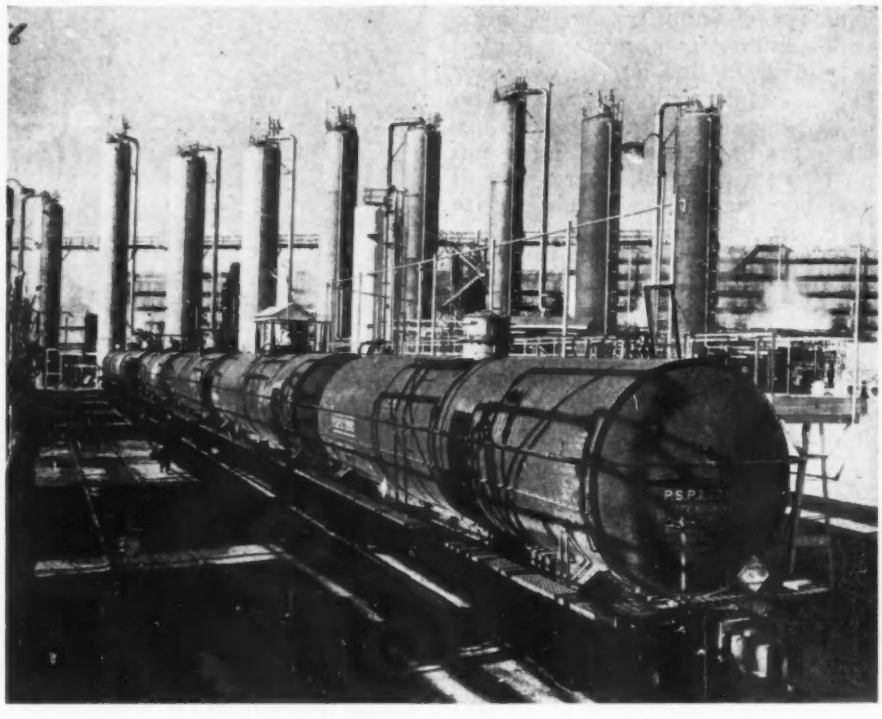
In spite of the obvious adaptability of tank cars to petroleum traffic, the railroads persisted in considering the boxcar as sufficiently satisfactory, describing tank cars as "special equipment" which the shippers could furnish if they cared to do so, but the railroads declined to provide tank cars. Finally, small refineries in Pennsylvania, Paraffin Works vs. Pennsylvania Railroad, 34 ICC 179, placed the issue before the Interstate Commerce Commission, asking for an order requiring railroads to furnish tank cars. The order asked for was issued, but it was set aside by the Supreme Court in United States vs. Pennsylvania Railroad Company, 242 US 250, holding that the Interstate Commerce Commission had exceeded its authority. Thus it is apparent the oil industry has been required from the very beginning of its existence to provide its own facilities.

A recent survey indicates the number of privately-owned general purpose tank cars available for petroleum



Drum storage rack (left), railroad tracks and storage tanks (background) at Phillips' Kansas City refinery.

Tank cars (below) at Phillips' gasoline plant at Phillips, Texas.



service has been reduced from 105,-600 just before World War II to 84,-523 (including 3500 cars in Canada) or 20 percent in a period during which the demand for petroleum increased about 60 percent. In addition to the general purpose tank cars, 10,-302 pressure-type tank cars are in liquefied petroleum gas service, the survey shows. Railway revenue from petroleum and its products in 1949 amounted to $324,544,720.00, equivalent to 4.64 percent of all carload freight revenue.

Barges have been used for the movement of oil almost from the very beginning of industry. The first barges were wooden scows about 100 feet long by 31 feet wide by 8 feet deep and carried crude oil in the hulls. The next improvement was the installation of iron tanks inside the wooden hulls of ships. In 1888 the first American all-steel tanker was built. Tank vessels, like pipe lines and tank cars, provide a specialized form of transport, suitable only for the movement of petroleum. They are owned or controlled by the industry through charter or lease agreements.

As of April 1, 1952, there was a total of 2225 barges and small tank vessels having a carrying capacity of 19,241,347 barrels in the service of the petroleum industry operating on the navigable rivers, the Great Lakes and along the intracoastal waterways of the Atlantic Coast, the Gulf Coast and West Coast. A good many of these vessels are owned outside of the petroleum industry, but they are on definite commitments which insure their continued operation.

Inland waterway type vessels during 1949 transported 2,259,000 barrels a day. Modern barges transport as much as 170,000 barrels, or approximately 850 carloads per trip. Savings in distribution costs by use of barges can only be realized by industry control, through ownership or charter, of barges and tow boats, as this method of transportation requires large investments in terminal storage at both origin and destination. The return of capital employed in barges, tow boats, supplementary equipment and facilities, demands assured supplies of products and a market for them which can only be provided by the industry.

Congress recognized the wisdom of control by the industry of water transportation when it exempted bulk carriers by water from the application of Part III of the Interstate Commerce Act.

Ocean tankers are used extensively in transporting petroleum and petroleum products to the East Coast, Northwest Pacific Coast and Alaska. The tanker movements for the East Coast originate in (1) United States Gulf Coast, (2) Caribbean, and (3) the Middle East areas. Movements for the Northwest Pacific Coast and Alaska originate in California. Approximately 33 percent of the world tanker fleet in commercial petroleum trade is utilized in the transportation of petroleum to United States destinations. Round trip voyages for all cargoes destined for United States ports, regardless of origin points, are about 4250 miles.

The utilization of tankers involves construction and maintenance of large amounts of storage at both the forwarding and receiving terminals. Utilization of tankers also requires the use of pipe lines from the oil fields in the interior to refineries and loading docks located on deep water. Refineries and marketing outlets support water transportation so as to provide a continuous movement of crude petroleum from the wells to refineries on the Gulf Coast or the Caribbean, and ship products thence to domestic

and foreign markets; or to move crude from the fields in the interior of the United States, South America and the Middle East, and thence by tankers to our ports.

It has been only in recent years that trucks have been used in the inter-city movements of petroleum products. The necessity of diverting large volumes of petroleum products from rail to truck movement during the last war—in order to make tank cars available for the movement of petroleum and petroleum products to the East Coast because that area's supplies were cut off by the activities of enemy submarines in the Gulf, Caribbean and Atlantic waters—brought the industry to a realization of the importance of this vehicle in the transportation and distribution of petroleum products.

Some of the principal advantages of this type of transport are: (1) low cost of original investment (2) flexibility (3) lower delivery cost for short hauls, and (4) savings in distribution expense by moving supplies from refineries, or other primary sources of supply, directly to service stations or other places of ultimate consumption, bypassing bulk plants and eliminating bulk plant expense. Deliveries of products can be made in hours by truck which would require days by rail. One 4000-gallon capacity truck operating on a 20-hour per day schedule will transport as great a volume of petroleum products as eight tank cars, and one 8000-gallon capacity truck will transport as great a volume of products as 16 tank cars on switching and short haul movements.

As of Dec. 1, 1950, there was in service a fleet of 26,783 trailers and semi-trailers with an average capacity of 4000 to 4500 gallons. In addition to this number of units, the industry had available for its use on the same date 10,962 straight trucks of 2500-gallon capacity for inter-city movements of petroleum and petroleum products. Transport units of the trailer and semi-trailer types are the most universally used for over-the-road transportation, but straight trucks are used to fill in when insufficient trailers and semi-trailer types are not available to transport all of the products to be moved.

While there are no data of total petroleum tonnage hauled by tank trucks, the Class I Interstate Tank Truck Operators, that is operators grossing in excess of $100,000 per annum—which was recently changed to $200,000 per annum—report to the Interstate Commerce Commission. These carriers operate less than one-third of the tank truck equipment in the U. S., but they do provide an indication of the trend of growth of this method of transport for petroleum products. In 1945, the Class I Tank Truck Operators hauled a total of 19,449,000 tons of petroleum products. By 1950, this tonnage had increased to 49,668,000 tons, an increase of 155 percent in tonnage over 1945. During this same period the domestic demand for petroleum products increased from 4,857,000 barrels per day average to 6,499,000 per day in 1950. This is a 34 percent increase in demand as compared with a 155 percent increase in tonnage hauled by the Class I Interstate Tank Truck Operators.

The use of tank trucks (common carrier, contract carrier and industry-owned) has greatly facilitated the distribution of petroleum products and has brought about improved service and economies for the consumer.

In spite of the remarkable efficiency of its present integrated set-up, the oil industry has been under attack and bills have been introduced in Congress seeking to divorce, one from the other, the necessarily inter-related processes of the industry. The proponents of this disintegration would destroy the efficiency which has made it possible to meet the ever-increasing demands for petroleum and its products, both civilian and military, at reasonable prices.

The oil industry is not seeking for itself any major changes in existing transportation laws or regulations, but it realizes that something should be done to remove the onerous burden of excessive regulation of the railroads and some other common carriers. As a student of transportation the writer believes that all that is needed in the way of federal regulation today are provisions for fair, reasonable and non-discriminatory rates, car service, and safety measures. The railroads should be permitted to abandon unnecessary and unprofitable mileage. They should be permitted to discontinue unprofitable service; they should be authorized to abandon promptly unprofitable operations without the months and sometimes years of delay with which they are now faced before their requests to state and federal regulatory bodies are acted upon; and they should be permitted to consolidate into a limited number of strong systems. The Interstate Commerce Act and related acts should be amended accordingly, and no unnecessary restrictions should be placed upon private transportation. Under such enlightened and limited regulation common carrier service would prosper and expand and this country could be fortified with adequate and economic transportation to meet its ever-expanding needs in time of peace and war.

The problems confronting the transportation industry—and such problems are of vital concern to the petroleum industry—cannot be solved by the carriers fighting among themselves; by one form of carrier seeking the imposition of burdensome regulations on another form, unless it is clearly and definitely established that such regulation is required and will serve the general interest.

In conclusion, it is believed that Congress should be concerned with the interests and welfare of the consumer. The adoption of any legislation which would interfere with the continued operation by the petroleum industry of its transportation systems would be against the interests of consumers of petroleum products, which includes all the people of this country.

About the Author

C. R. MUSGRAVE, vice president of supply and transportation for Phillips Petroleum Company, Bartlesville, Okla., worked as a water boy for a pipe line construction gang and started with the Atchison, Topeka & Santa Fe Railway in 1910 as a laborer in the operating department. He occupied various positions until 1922 when he resigned as agent and yardmaster in Independence, Kan. That year he joined Phillips Petroleum Company as assistant traffic manager, and he has served successively as traffic manager, general traffic manager, being named to his present post in 1930. He was elected to the board of directors and member of the executive committee in 1942. He is a director of the Wasatch Oil Company; director Great Lakes Pipe Line Company; director and member of executive committee, Transportation Association of America; director and founder member, American Society of Traffic and Transportation, Inc., and trustee, The Associated Traffic Clubs of America Foundation.

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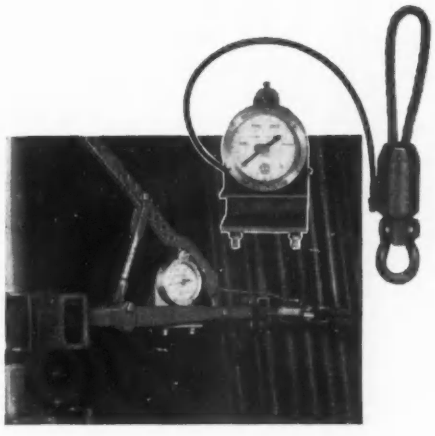
Supplementing Composite Catalog



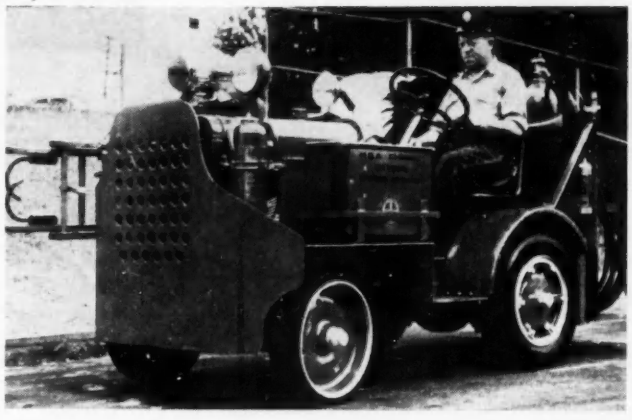
Tong Torque Gauge

Recent refinements in the Martin-Decker Corporation tong torque gauge make it possible to accurately measure the torque when making up joints with standard tongs. A cylinder has been designed to fit any tong handle so that it can be attached or removed simply and easily without changing clevises or any alteration to the lever. The regular cable can be connected to the other end of the cylinder. A cable pull up to 15,000 pounds has been provided on the direct reading dial gauge which permits easy conversion into foot pounds per torque readings. A separate pointer has been included for either indicating maximum pull for the joint or for manually setting to the maximum pull to be used by the crew.

This item supplements Martin-Decker Corporation data on pages 3145-3188 of Composite Catalog, 18th Edition.

Circle No. 13 on Postcard

Plant Fire Truck



A plant fire truck that negotiates narrow factory aisles has been designed by plant protection officials of Chevrolet Division, General Motors. This is a model C7-21 Clarktor mule equipped with an Ansul S-150 dry chemical fire extinguishing unit behind the driver's seat. Two Ansul 20-B hand extinguishers are placed on each front fender. The unit carries a 20-foot extension ladder, an MSA Chemox breathing apparatus, rubber boots, rope, fire axes, siren, headlights, a portable searchlight, a 50-pound carbon dioxide cylinder and a small vaporizing liquid type extinguisher.

This item supplements General Motors data on pages 1418-1423 of Composite Catalog, 18th Edition.

Circle No. 16 on Postcard

Conveyor Belt

A new type of conveyor belt that is virtually rip-proof has been produced by New York Belting and Packing Company. Designed for use where the belt may be subject to severe ripping or tearing action by foreign objects, the belt features special construction of multiple strands of high tensile steel wires imbedded at three-foot intervals.

This item supplements New York Belting & Packing Company data on pages 3667-3673 of Composite Catalog, 18th Edition.

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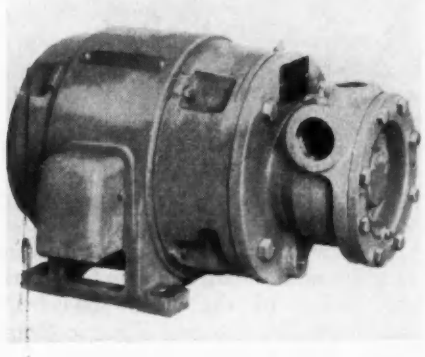


Turbine Vane Pump

For pumping hot and cold, clear and vaporous liquid, in moderate capacities against medium or high heads, Peerless Pump Division has introduced a complete line of turbine vane type pumps. Pumps close-coupled to face-mount electric motors are called Type TVE, while flexible-coupled electric drive pumps are Type TVB.

This item supplements Peerless Pump Division, Food Machinery and Chemical Corporation data on page 4165 of Composite Catalog, 18th Edition.

Circle No. 17 on Postcard

Bushing

Allis-Chalmers Manufacturing Company has a new type of "Magic-Grip" bushing for its stationary-control, wide-range "Vari-Pitch" sheave. The new bushing makes possible quick installation or removal of the sheave and permits mounting it on the shaft so that the adjusting control mechanism is either toward the motor bearing or away from it. The bushing consists of two split-tapered sheaves, one within the other. When drawn together with the locking screw, the bushing sleeve is contracted on the shaft and the outer sheave sleeve is expanded against the discs simultaneously to lock the entire mechanism with all working clearances eliminated.

This item supplements Allis-Chalmers Manufacturing Company data on pages 169-188 of Composite Catalog.

Circle No. 15 on Postcard

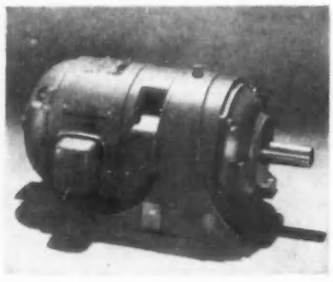
Save time! Keep informed! Circle numbers on postcard, page 91

Variable Speed Drive

Engineering features in the four variable speed drive units manufactured by Dodge Manufacturing Corporation are said to cut down-time on speed changes and increase production. The new variable speed drive combines a variable pitch motor sheave; a set of wide range belts; a companion sheave; and a slide motor base. The Dodge Taper-Lock principle is used in the bushings for both sheaves in the new drive and contributes to the rapidity and ease with which speed changes can be made. The cut-away displays how the sheave locks or unlocks on the motor shaft as a unit with the turn of one screw.

This item supplements Dodge Manufacturing Corporation data on pages 1431-1434 of Composite Catalog, 18th Edition.

Circle No. 18 on Postcard



Three Piece Motor

A new gear motor designed to simplify maintenance in case of electrical failure of the stator has been announced by General Electric Company. Built in three pieces, the unit permits quick and easy removal of defective stators without disturbing gear components or gear connections to the load. It includes a G-E tri-clad motor; a compact, planetary gear; and a mechanical adapter. Openings for motor ventilation are provided at the bottom, meaning that G-E open gear motors are now dripproof. The motor is available in ratings of 1 to 75 horsepower for standard applications and up to 200 horsepower for special applications.

This item supplements General Electric Company data on pages 1901-1920 of Composite Catalog, 18th Edition.

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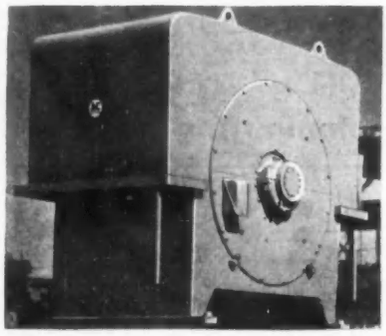


Covered Motor

A new outdoor weather-protected motor which carries protection much further than the splashproof design is made by Allis-Chalmers Manufacturing Company for use in semi-outdoor and outdoor steam electric stations. Motor intake velocity has been reduced to less than 600 feet per minute so that heavy raindrops cannot be drawn into the motor. Air moves vertically upward through side intakes into a greatly expanded air space, further lowering its velocity. Rain gutters on the sides at the air intakes, drain through piping to the ground. The air intakes are located high above ground level to protect the machine from dust and dirt during dry weather.

This item supplements Allis-Chalmers Manufacturing Company data on pages 169-188 in Composite Catalog, 18th Edition.

Circle No. 20 on Postcard

Plastic Coating

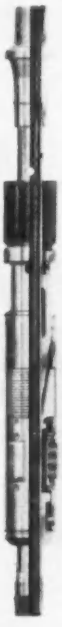
A new liquid-plastic coating which dries quickly to a smooth satin finish and is resistant to moisture, abrasion, fire and corrosion is made by Koppers Company, Inc., and Tennessee Eastman Company. It has been successfully tested on blades for industrial cooling-tower fans. Known as Aeroloid, it has been adopted for use on all sizes of Aeromaster Industrial Fans made by Koppers. The plastic has an acetate-butyrate base with certain added chemicals to give it resistance to combustion, quick drying and toughness qualities.

This item supplements Koppers Company, Inc. data on page 2750 Composite Catalog. 18th Edition.

Circle No. 21 on Postcard

Packer

A new packer which eliminates the common causes of packer failures has been developed by Oil Center Tool Company. Slightly smaller in diameter than most packers, the packer runs in without difficulty and goes right through tight spots. Large fluid bypass areas permit fast running, and premature setting is eliminated by the automatic clutch. Rugged construction prevents damage when running through tight places or foreign matter. Two turns to the right release the automatic clutch for settings, and the clutch relatches when the tubing is raised. All working parts are completely enclosed to eliminate fouling from debris or foreign matter and to assure positive setting.



This item supplements Oil Center Tool Company data on pages 3753-3780 of Composite Catalog, 18th Edition.

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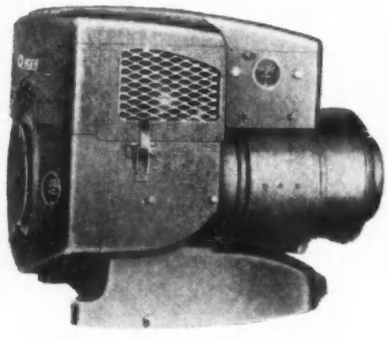


Electric Plant

A 3500-watt alternating current electric generating plant is offered by D. W. Onan & Sons, Inc. and is conservatively rated at 4000-watt peak overload capacity for periods of up to two hours operation. Model 305CK is designed to meet demand for higher capacity in small-sized electric plants. The 115-volt, 60-cycle unit is powered by the Onan "CK", a two-cylinder, four-cycle air-cooled gasoline engine.

This item supplements D. W. Onan & Sons Inc. data on pages 3966-3967 of Composite Catalog, 18th Edition.

Circle No. 23 on Postcard

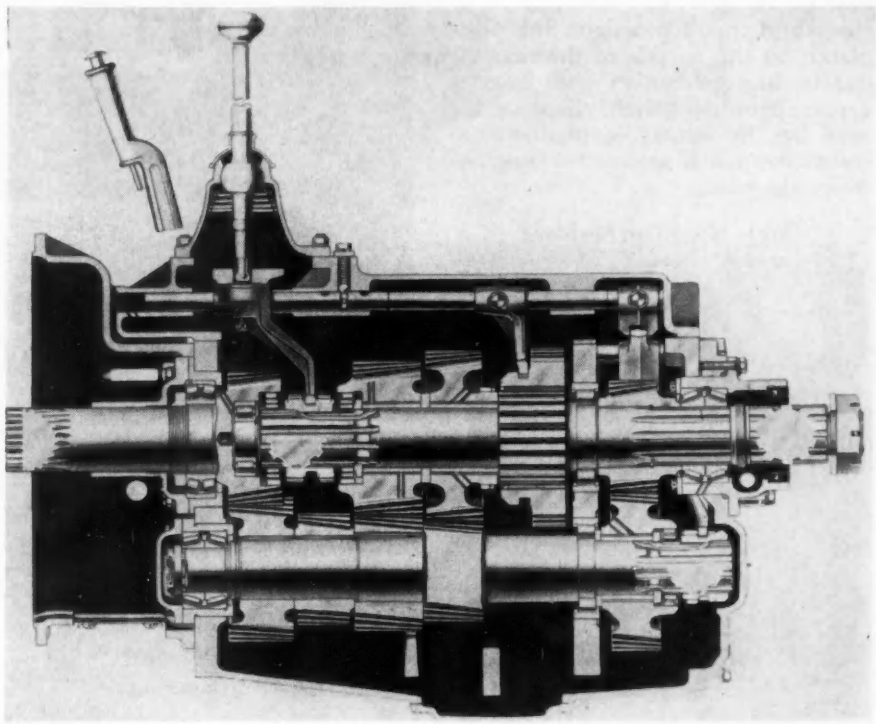
Save time! Keep informed! Circle numbers on postcard, page 91

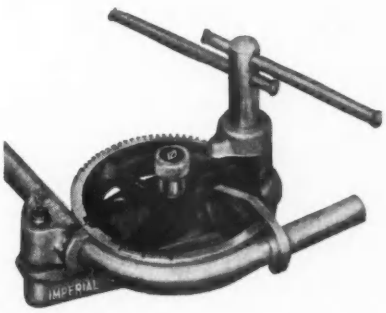
Other New Equipment

Electric Generator

Georator Corporation, Electric Products Division, has improved its "Nobrush" electric generator which is featured in a 400-cycle type. Permanent magnet construction avoids brushes in construction. Advantages of the brushless model include immunity to damage by moisture, overload or short circuit. In addition the model is durable in construction although reduced in size and weight. Requiring little maintenance, the model has eliminated radio interference. Units are furnished for belt drive or for mounting on driving motor or engine. Complete motor-generator or engine generator sets are available.

Circle No. 24 on Postcard





Tube Bender

A tube bender which the maker, The Imperial Brass Manufacturing Company, says will bend any type of tubing, including hard drawn copper and hard temper steel, is now available in a compact gear type. The bender is constructed so that it can be positioned on the tube at any point where a bend is desired. The high gear ratio is designed to make bending easier, a special advantage when working with hard temper tubing or large size tubing. Benders are designed so that they can be held by hand, clamped in a vise or bolted to a bench. Bender 270-F is available for tubing from 3/8-inch to 1 1/8-inch outside diameter.

Circle No. 25 on Postcard

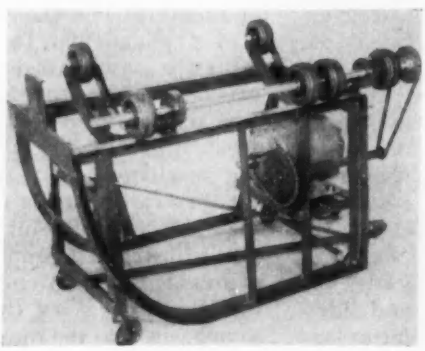
New Transmission

A new transmission for use with torque converters and designed for trucks up to 400 horsepower, has been announced by the Fuller Manufacturing Company. Designed with closely spaced gear ratios, and high ratio of capacity to weight, the new 4-FS-1440 makes new load-and-road performance possible in heavy hauling where conditions are unusually severe. The converter allows smoother load pickup and climbing, elimination of shock load on engines, drive lines and axles, and greater operator ease. The transmission was developed specifically to combine with advanced torque converters to provide greatly increased pulling power and versatility.

Circle No. 26 on Postcard

Portable Rotator

Structural improvements in the model 200 portable drum rotator have been announced by the Morse Manufacturing Company. Designed to agitate or mix drum contents up to 500 pounds in 30 to 55 gallon drums, the 200 model has been strengthened by a second horizontal steel brace which gives additional support to the idler wheels. The position of the drive motor has ben reversed to allow the idler reduction sprockets to be located inside the framework of the unit. The change in motor position and a new reinforcing vertical brace provide greater stability to the idler jackshaft.



Circle No. 27 on Postcard

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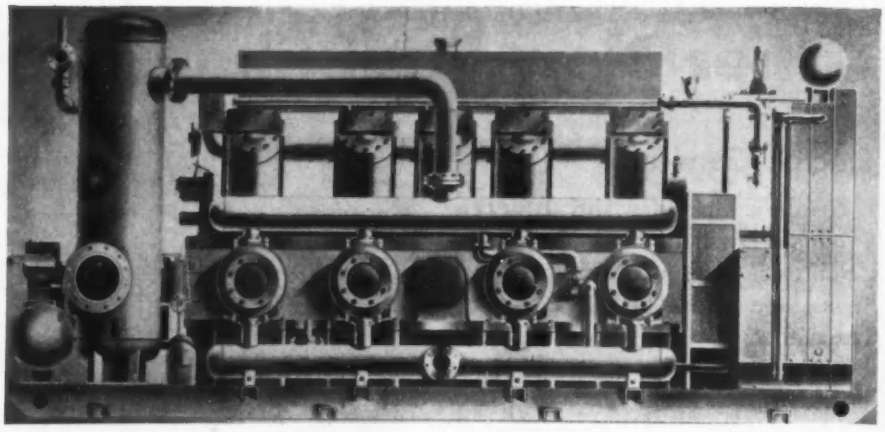
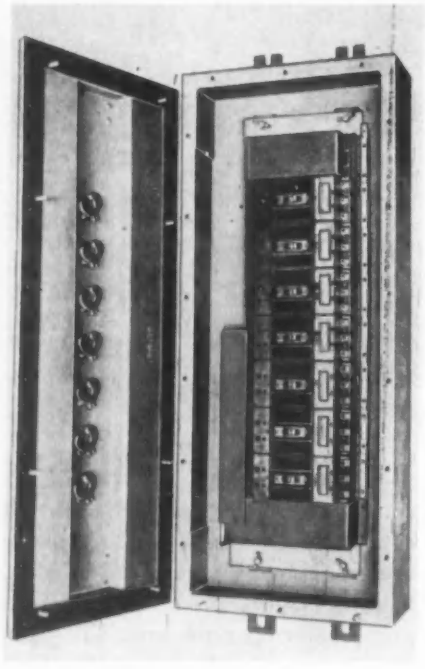
Post Trailers

Outside post construction in a lightweight truck-trailer is offered now by Trailmobile Inc., with the introduction of its new EP model in both closed and open-top designs. Side posts placed on the outside of the sidewall panels, in combination with heavier gauge aluminum panels, eliminate the need for horizontal corrugations to stiffen the panels against buckling between the posts.

Circle No. 28 on Postcard





Packaged Compressor Plant

A new 550-horsepower packaged compressor plant is made by J. B. Beaird Company. The compressor plant is equipped with the new 10 SVG Ingersoll-Rand gas engine-driven compressor and is the largest packaged compressor on the market. Complete packaging featured in Beaird plants includes gas piping, scrubbers, manifolds and when required, interstage scrubbers and cooling coils. The cooling system has a radiator with coils for jacket water, lubricating oil and gas. Water temperature is controlled automatically. The assembled plant is mounted on a structural steel base when packaged and may be transported as a unit to the location. It requires a concrete slab as a foundation.

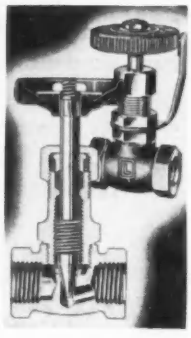
Circle No. 30 on Postcard

Panelboard

Crouse-Hinds Company has developed a new type DTP cast aluminum dust-tight, and weather-resistant panelboard which will accommodate up to eight three-pole, 100-ampere, 600-volt circuit breakers. The panelboard consists of a rectangular cast aluminum enclosure with gasketed cover and dust-tight and weather-resistant external operating mechanisms for the circuit breakers. The external operating mechanisms are so constructed that they can be made to engage the circuit breaker handles after the cover is installed. Ample gutter space is provided at both ends and sides of the circuit breakers, the latter being factory wired to the main busses. The board can be arranged for either top or bottom feed.

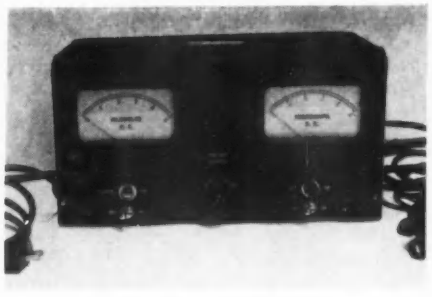
Circle No. 29 on Postcard

Needle Valve



A new gland-type bronze needle valve made by The Lunkenheimer Company is for use in pin-point control on small lines where fine regulation of flow is essential. It is manufactured in sizes from ⅛- to 1-inch in both globe and angle patterns. The handwheel is the "Non-Slip" design, for fingertip control. The control valve is also available in an indicator model, from ¼- to ½-inch. The handwheel on the indicator valve is of cast bronze and has number graduations on its face, permitting resetting to a predetermined degree of opening. A spring clip engaging serrations on the outside of the wheel holds the valve securely at its proper setting.

Circle No. 31 on Postcard



Voltage Tester

A new direct current high voltage dielectric strength testing instrument is now being manufactured by Association Research, Incorporated. The instrument has a continuously variable voltage output and a means to measure output current. Designed for electric insulation tests requiring various potential stresses, it permits calculation of direct current resistance based on test voltage and output current flow. The ammeter is protected against damage by output short circuit; and the alternating current ripple is within one percent.

Circle No. 32 on Postcard

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Portable Loading Ramp

A brochure by John B. Illo Engineering Company describes a portable loading ramp unit that enables one man to perform loading with push-button control, thereby eliminating costly standby time during loading and unloading. The ramp can be installed in five minutes at any loading dock and its hydraulically operated dock adjusted to any truck bed height in a few seconds. Available in either manual or electrically powered models, it has a deck travel of 24 inches.

Circle No. 33 on Postcard

Expansion Joints

Flexonics Corporation has released an illustrated eight-page catalog covering Chicago Metal Hose and Flexon Expansion Joints used in the oil industry.

Circle No. 34 on Postcard

Stainless Steel Tubing

A new data card issued by the Tubular Products Division of The Babcock & Wilcox Company discusses Croloy 18-8 Ti (AISI Type 321), and includes condensed data on corrosion resistance, creep strength, oxidation resistance, mechanical properties, and others.

Circle No. 35 on Postcard

Pressure Seal Valves

Only issued recently, the new pressure-seal valves catalog describing pressure-seal stop, check and non-return valves manufactured by Edward Valves, Inc., contains separate spreads on each of these products. Tables and charts make it easy to calculate pressure drop; and material specifications, both chemical and physical characteristics, are given.

Circle No. 36 on Postcard

Upsetting Tubular Stock

A new Varco service in the Southwest for upsetting tubular and solid stock and forge work is described in a recently issued folder by Abegg and Reinhold Company. Upsetting and die forging operations on diameters up to four inches round with upsets up to 6½ inches in diameter are described. New Varco threading facilities are available for API pipe and tubing threads. Another service described as available is bucking on of couplings and tool joints, and heat treating to specifications.

Circle No. 37 on Postcard

Stainless Tubing Steel

Two economical stainless tubing steels having the attributes of resistance to corrosion and oxidation, and also the ability to be hardened by heat treatment to develop good mechanical properties, are discussed in a new technical data card issued by the Tubular Products Division of The Babcock & Wilcox Company. Included are condensed technical data on corrosion resistance, mechanical properties, forging, machining, welding, heat treatment, and physical properties.

Circle No. 38 on Postcard

Odorization of LPG

A newly developed method for odorization of liquid petroleum gas, is announced by J. B. Calva & Company in their new bulletin. Calva has devised a simple way to add odor to the vapor phase of the fuel as it is being released from the cylinder, thus insuring uniform odorization. The method is a modification of the standard gas-release valve on the cylinder so an odorizing cartridge can be inserted.

Circle No. 39 on Postcard

Wires and Cables

The electrical wire and cable department of United States Rubber Company has published a 186-page general catalog of its line of more than 500 different types of wires and cables. The catalog contains comprehensive data on construction and operating characteristics.

Circle No. 40 on Postcard

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The search for oil is made more difficult by . . . .

Odd Geologic Structures of Southern Oklahoma

Hunt for new reserves will be aided by understanding of unusual conditions found in the Ardmore district.

Part 1

By DR. C. W. TOMLINSON
Geologist and Producer, Ardmore, Okla.

AN INTENSIVE DRILLING campaign in Southern Oklahoma during the past few years has revealed striking information which confirms the existence of some very odd geologic structures. These geologic "contradictions" make the search for oil much more difficult than in areas where one encounters "conventional" type structures. Therefore, perhaps a description of the more pronounced geologic oddities found in Southern Oklahoma will assist the geologist and the producer in their search for new reserves. This is important since Southern Oklahoma now accounts for a very large part of the state's daily production, and possibly many more prolific oil fields will be found if there is a better understanding of geologic conditions in the province.

Pseudo-plastic folding—Caddo and Overbrook anticlines: Among the most striking geologic structural features of the Ardmore Basin are the Caddo and Overbrook anticlines. As seen in the surface strata, these are extremely sharp folds, each involving structural height of at least 5000 feet; with dips averaging over 60 degrees, but ranging up through vertical to the overturned position. Both folds are locally almost isoclinal: hairpin folds with central cores of Springer shale—lowermost Pennsylvanian.

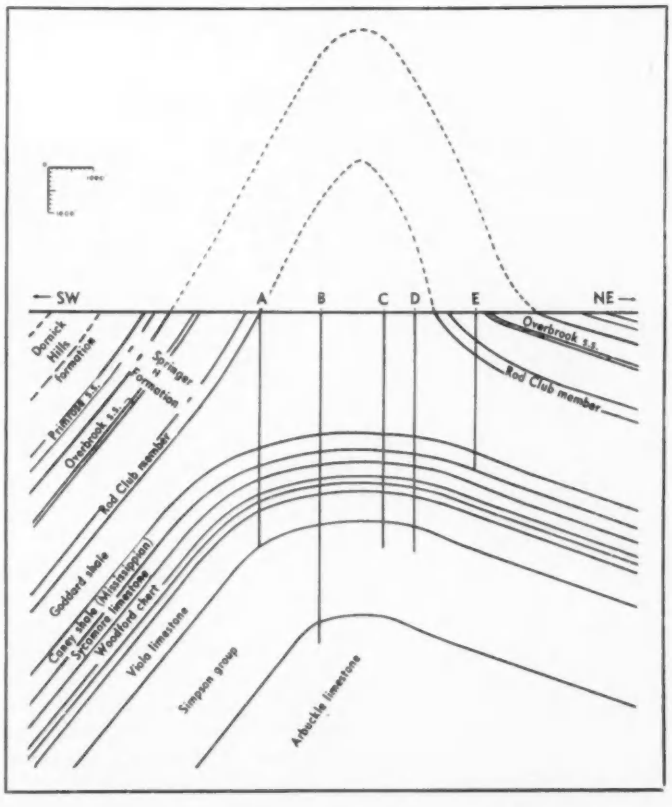

FIGURE 1. Cross Section of Caddo anticline.

Proven for the Caddo anticline (Figure 1), by drilling, and probable for the Overbrook fold also (Figure 2), is a tremendous diminution in sharpness of folding downward, in the competent earlier Paleozoic section, chiefly limestone and dolomite, aggregating more than 11,000 feet in thickness. This solid base, too, was greatly deformed in this region in the late Pennsylvanian (Arbuckle) orogeny which produced these folds. But in these two anticlines its folding was mild compared to that of the soft shales above—some 7500 feet of them with only thin rigid layers at wide intervals. The pre-Pennsylvanian rocks may even be homoclinal under the Overbrook anticline, where they have not yet been reached by the drill. Under intense lateral compression, the overlying shales were squeezed upward into the zone of erosion almost as if they had been salt—into a sort of sandwich filling in the resulting hairpin fold, between thick flanking slabs of somewhat more competent, later Pennsylvanian

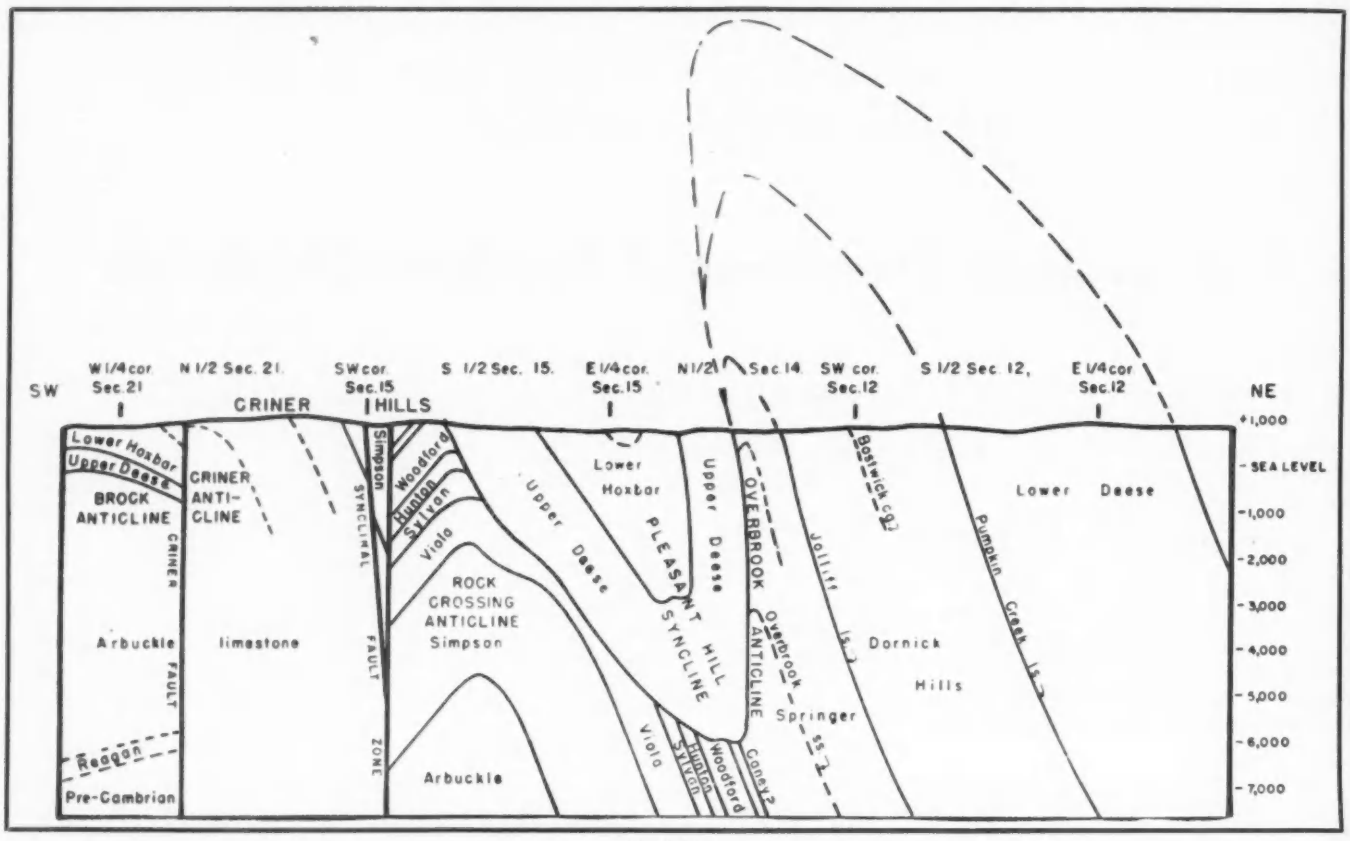

FIGURE 2.
Cross section through Criner hills and associated structure.

sediments in both of the steep limbs of the fold.

Most of this movement appears to have been accomplished by upward slippage of each laminary bed of shale upon the one beneath: much as a deck of cards can be pushed askew with great aggregate displacement of the top card relative to the bottom one, but with only trifling differential movement between any one card and its neighbor. In this deck there were many thousand cards. Bedding slippage may have graded into minor shearing and thrusting; but important single faults are not apparent on the Caddo anticline, nor along much of the length of the Overbrook fold. The movement within the shales might be described as semi-plastic or perhaps better, pseudo-plastic.

An equally striking but smaller example of semi-plastic folding occurs at "The Spectacles" (S. 26, T1 S, R2 E; Figure 3), where a plunging anticline in the Viola limestone (Ordovician center of Figure 3) (and shown above middle of right hand edge of Figure 4) forks to the southeast into two plunging anticlines in the Hunton group (Silurian and Devonian). The separating syncline, which has a structural depth of more than 100 feet, is completely lost in the semi-plastic Sylvan clay shales (upper Ordovician) between the two limestone units.

FIGURE 3.
The Spectacles, 26-1s-2e, Murray County, Okla., looking southeast. Ov-Viola limestone; Oss-Sylan shale; Sdh-Hunton group; Pp-Pontotoc group.

Close Juxtaposition

Figures 4 and 5 illustrate the extremely close juxtaposition of folds in parts of the Arbuckle Mountain region. For in each of these aerial photographs three parallel anticlinal folds separated by two synclines appear side by side within a distance of two miles. Figures 5 and 6 also show how completely the structures beneath an unconformity can be concealed by later sediments: Cambrian in Figure 6, Pennsylvanian in Figure 5.

Sediments downfolded below their original position—Ardmore syncline: A notable feature of the central Ardmore syncline itself (Figure 7) is the fact that the pre-Cambrian floor in the bottom of its trough is probably much deeper below the present surface of the earth, than the aggregate stratigraphic thickness of the overlying sediments. It is difficult to draw a cross section through the deepest portion of this trough without carry-

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FIGURE 4.
Vines Dome, Daugherty anticline and The Spectacles, Sects. 21-22-26-27-28-33-34-35, Twp. 1s, R 2e, Murray County, Okla. Abbreviations as in Figure 3. Also Os-Simpson Group; Mw-Woodfort chert; Ms-Sycamore limestone; Qal-Alluvium.

FIGURE 5.
Slightly folded Pennsylvania strata lying unconformably across closely folded and truncated older rocks northwest of Turner Falls in Sects. 13 to 15 and 22 to 27, Twp. 1s, R 1e, Murray County, Okla. Abbreviations as in Figure 3. Also Pcg-Pennsylvanian conglomerate.

ing the base of the sediments at least 40,000 feet deep—though there are only about 27,000 feet of strata there, measured at right angles to bedding. Such excess depth must be true of any syncline whose average dips exceed 45 degrees and the Ardmore trough is nearly isoclinal at Ardmore. It necessarily implies that the base of the trough was forced downward into the earth's crust during the 16-mile crustal shortening accomplished here in the Pennsylvanian period: while the adjoining mountain anticlines were being squeezed up. Relative structural heights and depths were thus produced, in excess of the eight-mile present depth of the great syncline.

Thickened Masses

In this trough as well as in the anticline described above, the major shale masses have been thickened near the axial plane and thinned by compression on the flanks, much as in the tight folds that are so common in metamorphic rocks. But the resulting folds here do not all conform wholly to the traditional pattern of "similar" (as distinct from "parallel") folding which should result from that squeezing process in a uniform sequence of sediments. The contrast in competence between the great lower Paleozoic succession of carbonate rocks and the thick mass of soft shales above brings about smoother, more broadly curving folds in the limestones than in the overlying shales. This is particularly well shown in the Caddo anticline (Figure 1),—the only one of the three major folds above mentioned in which the form of the fold in the limestones has been determined by drilling.

Tight, even overturned folds do

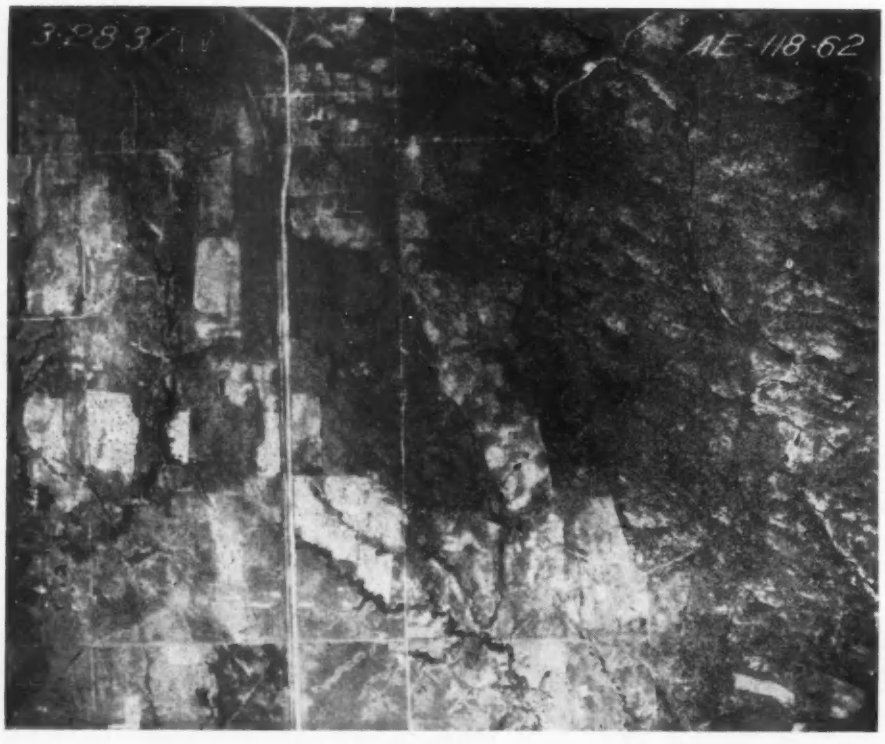

FIGURE 6.
Joint systems in pre-Cambrian Tishomingo granite near Troy, Okla., in Sects. 2, 3, 4, 9, 10, 11, 14, 15, Twp. 3s, R 5e, Johnston County, Okla.

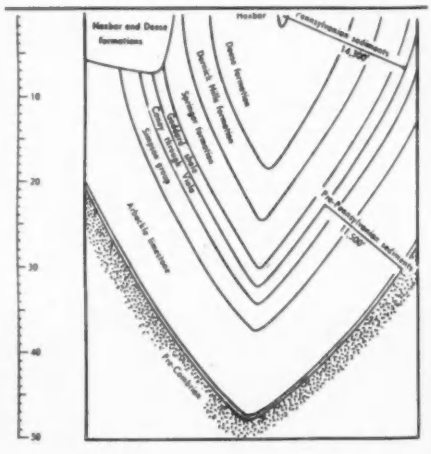

FIGURE 7.
Diagrammatic cross section of Ardmore syncline.

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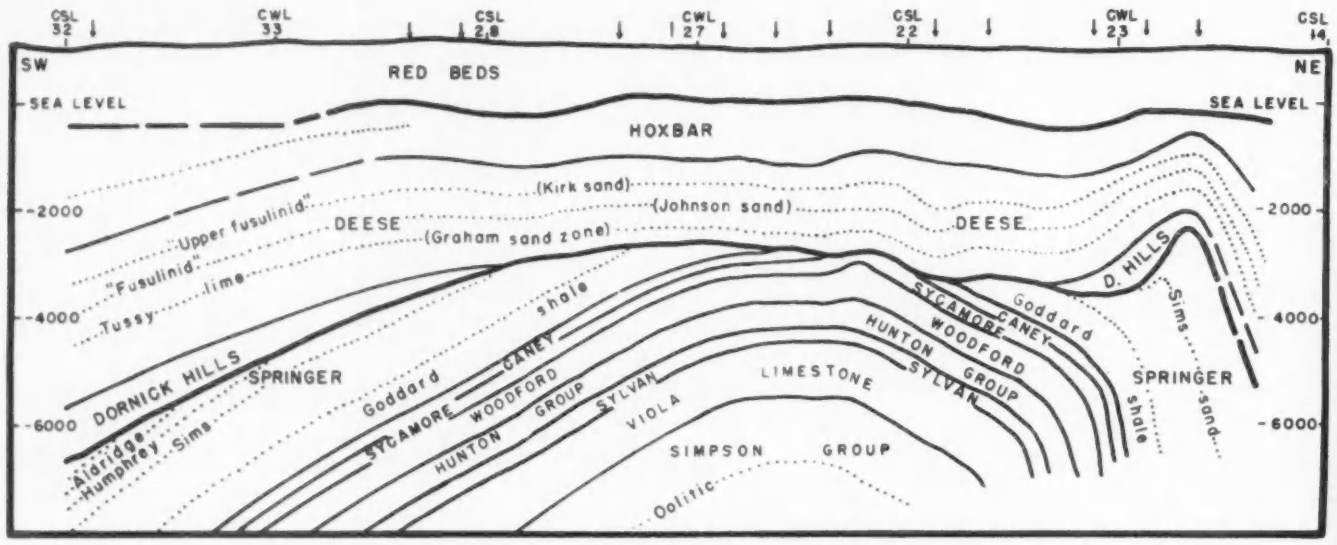

FIGURE 8.
Cross section through Fox-Graham oil field.

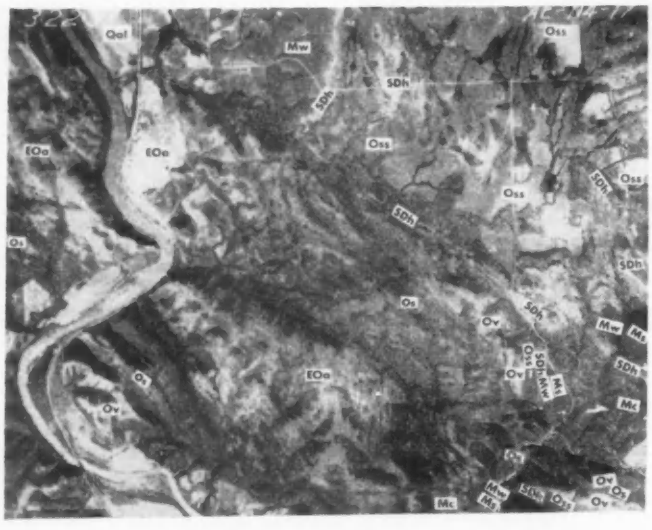

FIGURE 9.
Horst-graben of Crusher, Okla.; Sects. 19 to 21 and 28 to 33, Twp. 2s, R 3e, Murray County and Sects. 24, 25, and 36, Twp. 2s, R 2e, Carter County, Okla. Abbreviations same as in Figures 3 and 4. Also EOa-Arbuckle limestone.

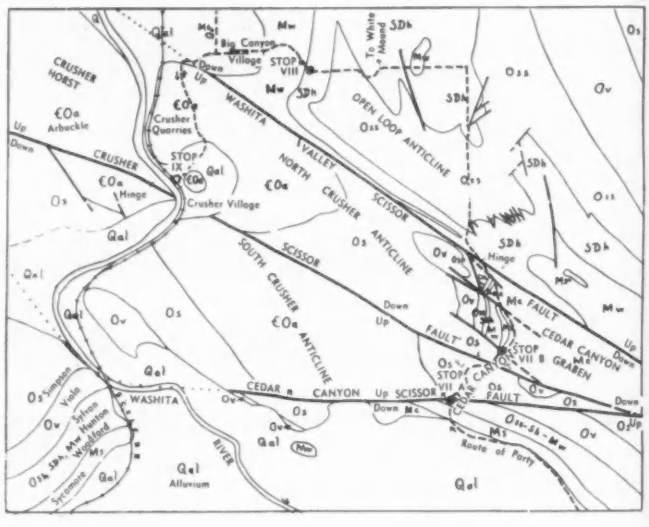

FIGURE 10.
Geologic map of Crusher area.

exist in this region even in the most massive limestones, as at the Crusher locality described later in this article. But it was surely not less intense in the less competent strata above, which there have been removed by erosion.

"Rabbit-ears" anticlinoria, Fox-Graham and Velma oil pools. As will be noticed in the cross section (Figure 2), the central anticlinal massif of pre-Pennsylvanian limestones in the Criner Hills is flanked on both sides by other anticlines parallel to it, in which the competent core of older rocks is not so high. The Overbrook fold, indeed, may be a truly "rootless anticline," with no anticlinal core beneath the Caney shale (upper Mississippian). A similar situation has been proved by drilling to exist in the Fox-Graham pool (Figure 8) and in the Velma pool (Rutledge, 1951).[1] Both of these pools lie along a single major uplift over 30 miles long; in which a central anticline with a high core (locally of horst character) of early Paleozoic limestones is flanked on each side by a belt of Springer shales and sandstones. This central fold was produced, in the main, relatively early in Pennsylvanian time. It was truncated by erosion, and the beveled surface covered by sediments of late Des Moines (upper Deese) and Missourian (Hoxbar) age. In the subsequent Arbuckle orogeny squeezing the adjacent synclines, there was sufficient upward differential movement, probably by bedding slippage in large part, in the Springer shales on the flanks of the central massif to create anticlinal folds in the unconformably overlying Deese and Hoxbar strata, which are locally sharper and higher (in those strata) than the central major arch. The latter is the skull of the rabbit, the sharp side folds his ears. In the Graham (northeast) ear, drilling already has demonstrated the absence of an anticlinal core in the pre-Pennsylvanian. (Figure 8).

The process acting in the creation of these "rabbit-ear" folds was essentially that outlined by Chamberlin

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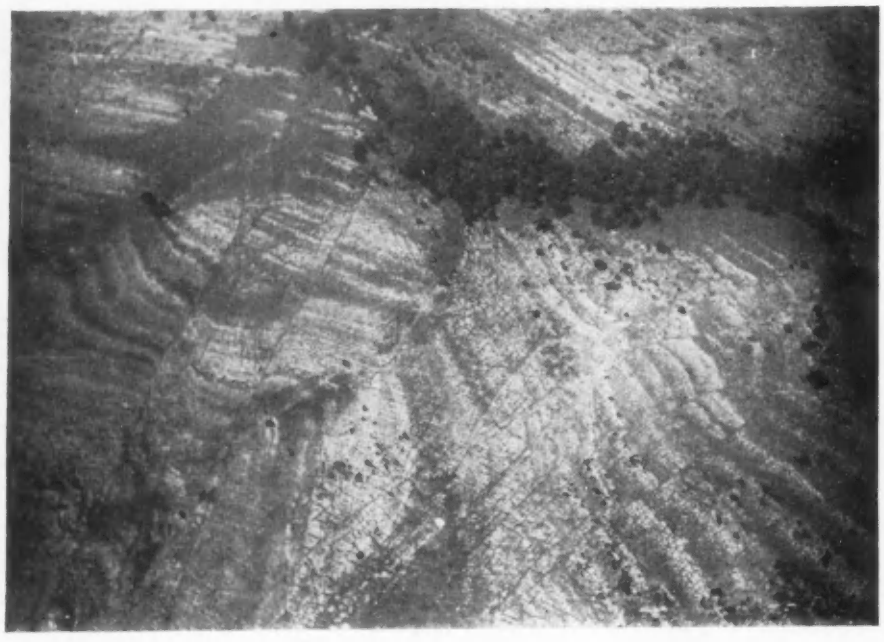

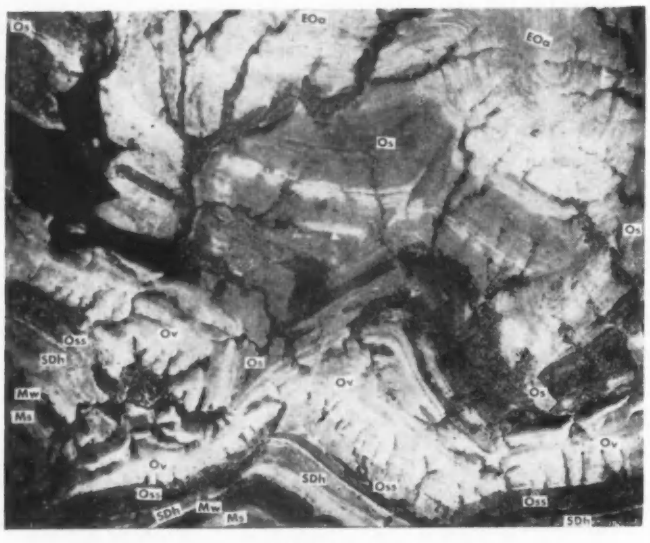

FIGURE 11 (above). Arbuckle limestone mosaic in Sects. 32-33, Twp. 2s, R 4e, Murray County, Okla., looking south-southwest.

FIGURE 12.
Faults and folds near Woodford, Okla., in Sects. 13 to 15 and 22 to 27, Twp. 2s, R 1w, and Sects. 18, 19 and 30, Twp. 2s, R 1e, Carter and Murray Counties, Okla. Abbreviations as in Figures 3, 4 and 9.

(1925)[2] as the natural tendency of sediments in a sharp syncline under compressional stress to climb up the sides of the synclinal wedge: permitting the upper V's to rise relative to the lower ones as the sides of the wedge move closer together, making the trough sharper and narrower.

Hinge faults: Cedar Canyon fault. Faulting, too, has produced some extraordinary structural features in southern Oklahoma. The Cedar Canyon fault, a short distance west of its junction with the Washita Valley fault, has no stratigraphic displacement, but lies along an anticlinal axis with the Bromide formation present on both sides. (S 33, T 2 S, R 3 E; see S.E. corner of Figures 9 and 10.) But on the south side of the fault this is replaced westward (Figures 9 and 10) by successively younger strata striking into the fault at an acute angle; whereas on the north side of the fault successively older formations appear. Less than a mile west of the hinge point the stratigraphic displacement exceeds 4000 feet; for the Arbuckle limestone (Cambrian and Ordovician) on the north side of the fault lies in contact with Caney shale (upper Mississippian) on the south.

Many faults of smaller maximum displacement disappear in a short distance (Figure 11), in some cases passing first into small monoclinal folds. The Woodford fault, which has a stratigraphic displacement of 1200 feet or more just north of that village (S.W. corner of Figure 12), downthrown to the northwest (Ordovician Viola against Mississippian Sycamore), passes northeastward, in little over half a mile, into a sharp anticlinal nose in the upper half of the Simpson group. There for a similar distance no stratigraphic displacement appears along the projection of its trace. But farther to the northeast it reappears, again with northwestward downthrow but with smaller displacement, cutting the lower half of the Simpson and the upper part of the Arbuckle limestone. The stresses that produced the faulting in both faulted stretches presumably were satisfied by folding in the intervening area, though the stresses operated in one way or the other along the whole length of this deformed belt.

About the Author

DR. C. W. TOMLINSON of Ardmore, Okla., is a former president of the American Association of Petroleum Geologists. He was graduated from the University of Wisconsin in 1913 with a B.A. degree and received his M.A. degree the following year. He obtained his Ph.D. in 1916 from the University of Chicago. Before becoming an independent oil producer in 1933 he served as geologist, Gypsy Oil Co. (Gulf) in the Rocky Mountain states (1918-21); geologist, Schermerhorn-Ardmore Company and affiliates (1921-33); professor of geology, Mississippi A. & M. College (1916-17) and associate in geology, University of Illinois (1917-18). He is an authority on the geology of Southern Oklahoma.

REFERENCES

[1] R. B. Rutledge, map and cross sections of Velma Pool: Figures 15, 16, 17, 18, pp. 601-605, accompanying article by Erwin L. Selk, "Oil and Gas Traps in Southern Oklahoma," *Bull. Amer. Assn. Petr. Geol.*, vol. 35, pp. 582-606, March, 1951.

[2] Rollin T. Chamberlin, The Wedge Theory of Diatrophism: *Jour. Geol.*, vol. 33, pp. 755-792, 1925.

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Is Seismology The Career For You?

Working conditions are not always the best. But the work must always maintain high standards.

By **ROBERT J. FOSTER**

THE YOUNG GEOLOGIST was reporting to his first field assignment. "Why did you choose this job," the party chief asked. The young geologist mumbled something about "interesting work."

The party chief smiled and replied: "The romance is over now that you're here, and there's nothing left but hard work."

At the moment there is a large turnover of computer-trainees in the seismic industry. This is possibly due to a misunderstanding of the exact nature of the work. To the far-away college student, the moving life of a seismologist may seem very romantic. There are two sides to the story.

The seismic industry of today is expanding at a very rapid rate. It is trying to attract more and more of each year's college graduates. A few facts are in order to acquaint the young geologist with the pros and cons of nomadic life and also possibly to help the industry solve the manpower problem it is facing.

The average seismic crew consists of about 18 men. They are, in the order in which they work:

Permit man—gets permission to trespass on owner's land.

Surveyor and rodman (and perhaps brush cutter)—lays out seismometer stations and shotpoints. (The surveyor may also do the permitting).

One or more drillers each with a helper—drills shot holes with truck mounted drills.

Water truck driver—provides necessary water to drill holes.

Shooter and helper—loads explosive in the hole and detonates.

Observer, junior observer, and several recorder helpers—lay out cables, attach jugs and take records. The observer is in charge of the field crew and so his job calls for good personnel management as well as a very thorough knowledge of his instruments and the ever present problem of how to get a good record.

Office staff, consisting of party chief, and first and second computers and often a geologist (usually a client geologist). In the office the records are stamped and labelled, the weathering is calculated, the reflections are picked, timed and plotted on a cross section. The reflections are then correlated and a contour map is made.

To the young college graduate only three of these positions are open—observer, surveyor and computer. This is true of oil company crews, but the

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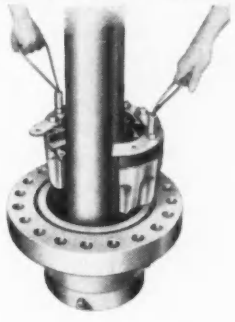
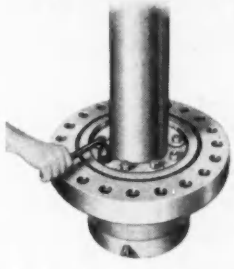
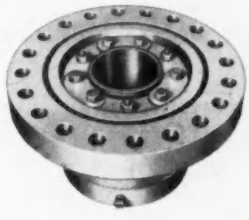


• To suspend the next string of casing, a Unitized Packing and Slip Assembly is simply wrapped around the casing, a single bolt inserted and the Assembly lowered into the Head — an operation made still more convenient by removable wire handles furnished with the unit!



• The casing is then lowered onto the slips, the handles removed and gland bolts tightened to expand the packing!



• After it is packed-off, the casing can then be cut off flush with the top of the flange—and the job is done!

Note that there is no need to strip parts over the casing string . . . no need to break any connections . . . no need for special supporting devices . . . no need to cut the casing before packing it off!

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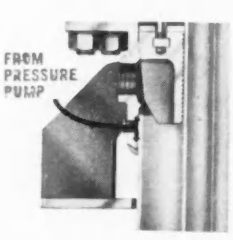

In addition to their many other advantages, Baash-Ross "UPS" Heads incorporate the popular weld-test feature, first pioneered on Baash-Ross Type "X" Heads, for checking the tightness of the welds between casing and head.

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Moreover, at any time throughout the life of the well, the welds can be similarly checked and any leaks that may develop can be quickly sealed off by simply injecting plastic-pack material into the annular groove. It's a feature that makes double savings — (1) at time of installation, and (2) lifetime protection against any subsequent leaks at the welds!

Baash-Ross "UPS" Well Heads are available in a complete selection of sizes — both with and without landing bases — for threading or welding to the casing . . . with two types of Tubing Head Bodies, "Standard" and "Short" (outlets placed in flange for maximum compactness).

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contract companies, which do most of the industry's work, can afford to hire college men only as computers, since the seismic business is very competitive.

The advantages of "doodlebugging" are fairly well known, and they are the chief reasons why people choose doodlebugging as a career.

For the uninitiated doodlebugging is a colloquialism applied to any phase of geophysical work. The disadvantages and the effect that the life has on people are less well known, so that many people waste a year or so of their careers, only to discover that they or their wives are not emotionally equipped to live a nomadic life.

Contracting companies can offer fairly high starting salaries to computers, and this coupled with the rapid advancement that is possible in these companies is the main reason many begin doodlebugging. A great many computers can add about $100 to their monthly salary in the first year. A few can make party chief in two to three years and thereby double their starting wage. Then too, the chance to travel and even go foreign is a strong incentive to many. The author, who previously had not been west of New York state, spent in one year, the Fourth of July in Cuero, Texas; Thanksgiving in Monterey, Mexico; Christmas in Santa Fe, New Mexico and Aspen, Colorado; New Year's Day house hunting in Fresno, Calif.; and Fourth of July in Seattle, Washington. Monterey, Santa Fe, Aspen, and Seattle, of course, were trips taken over the holidays, made possible by the custom of working on the weekend preceding a holiday in order to make every holiday a long weekend. Of course, this freedom to work up time has a large drawback in that days too wet for work must be made up on weekends too, so that one is often forced to take off bad days and break engagements on good holidays.

The disadvantages of doodlebugging and the effect that the life has on people center around the fact that one can never have a home and so never makes any friends beyond his own crew. Even crew friendships are only temporary, due to individual moves. Never having any permanent friends and so having little social life in a few years has an effect on one's personality and outlook on life.

The most noticeable effect to the newcomer is the lack of any outside interests except the work. This is the natural result of long hours of work, plus association with only other doodlebuggers because one moves too often to locate other friends who share your interests. This can be seen in many ways. Doodlebuggers don't know what to do when they have time off and often drift down to the office and putter around. The author has known several who didn't even want to take their vacations because they'd go crazy with nothing to do for two weeks. For all of this, however, most doodlebuggers are a very happy, carefree lot who can always manage to have a good laugh no matter in what circumstances they find themselves. In fact, that may be said to be the one important quality necessary to be a happy doodlebugger, and must be possessed by both the man and his family.

Before choosing doodlebugging as a career one should carefully view both the advantages and disadvantages and also the effect on his family. Constant moving is harder on the wife as it is she who must do most of the job of moving and settling, and who is also more dependent on local friends during working hours when she is alone. Children also must change schools several times a year, which is often a hardship on them, as they too must make all new friends after each move.

A car and/or trailer large enough to hold the family and all possessions is also a necessity, but can be acquired after commencing work. There are also constant problems of trying to locate reasonable places to live where landlords won't mind children, dogs, cats and short notice of departure. Most families after several moves and living in all sorts of apartments find a house trailer the solution to many of the problems, and this possibility, especially for the family man, should not be overlooked. However, realizing the existence of such problems before entering upon a doodlebugging career is a great step toward a successful and happy adaptation to that way of life.

In the past too many have accepted positions and after several moves found that they or their wives were not emotionally equipped for the life and had wasted their own time and their employer's investment in their training; a very unprofitable experience both to themselves and their employers. It is hoped that the foregoing will help to give prospective college graduates some insight into doodlebug life and perhaps attract more people permanently into an interesting and very promising industry.

Laying-out the cable to which seismometers are attached. Most companies equip cable-reels with safety devices to protect reeler, who must ride rear platform across rough terrain.

About the Author

ROBERT J. FOSTER received his bachelor's degree in Geology from the Massachusetts Institute of Technology in June 1951. Since that time he has been employed by Geophysical Service Inc., Dallas, as a computer on field parties in Texas and California.

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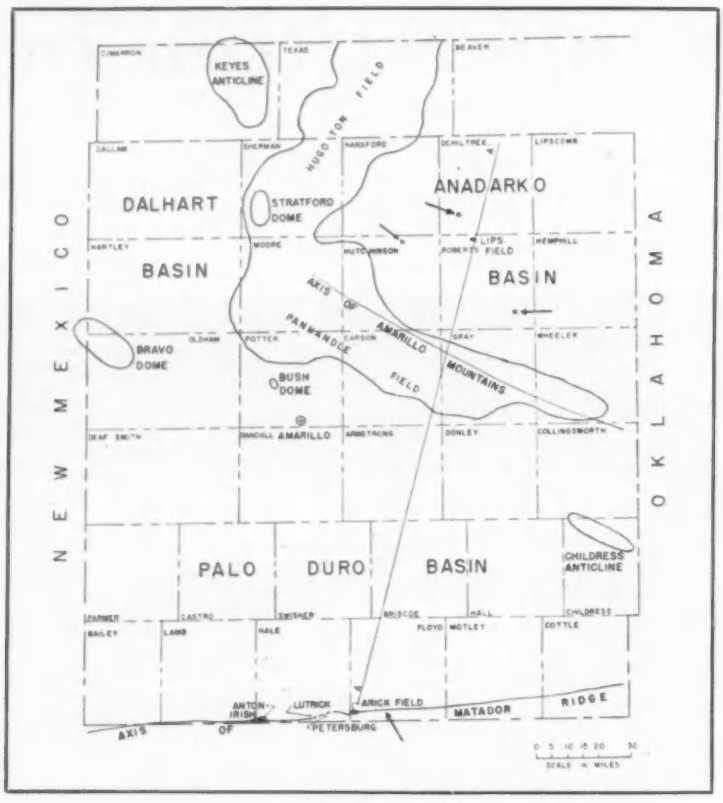

FIGURE 1.
This map of Texas Panhandle shows principal structural features and producing fields. Areas of recent interest indicated by arrows.

Discoveries in Panhandle Back Up Geologic Theory

Stratigraphic and structural conditions indicate possibility of new oil and gas fields.

By FRED R. HAEBERLE
J. J. Lynn Oil Division, Abilene, Texas

THE DISCOVERY wells completed in the past year in the Panhandle of Texas have attracted a great deal of attention to this region. Recent discoveries, such as Sinclair Oil Corporation and The Texas Company wells in the Lips area, the Gulf 1 and 2 Haggard, and the Standard of Texas 1 Adams, have shown that this northwestern section of Texas does contain oil outside of the Panhandle field itself—perhaps in large quantities. In the past many operators, despairing of finding oil in the Anadarko or Palo Duro Basins, have moved elsewhere. These discoveries add proof to the theory that any sedimentary basin containing source and reservoir rocks will produce oil under the proper combination of these two factors.

The Panhandle of Texas is considered to include the area north of the Matador Ridge, extending across southern Bailey, Lamb, Hale Floyd, Motley and Cottle counties, including 32 counties with an area of more than 30,000 square miles. Structurally, the Panhandle must be extended to include the three counties of the Oklahoma Panhandle and the northeastern counties of New Mexico.

Structural conditions in the Panhandle are complicated by the fact that it is the meeting point of several major provinces, the Permian Basin from the south, the Anadarko Basin and the Amarillo-Wichita uplift from the east, the Hugoton embayment and Kansas shelf to the north and the Rocky Mountains on the west. Each of these features has exerted its influence on the structure and stratigraphy of the Panhandle, and the geology must be deciphered with due respect to these outside influences.

The principal structural features of the Panhandle, as shown in Figure 1, include the Anadarko, Dalhart and Palo Duro basins and the Keyes anticline, the Stratford Dome, the Amarillo Mountains, the Matador Ridge plus several smaller uplifts.

The southern edge of the Panhandle is bounded by the Matador Ridge, apparently a westward extension of the Electra Arch of north-central Texas. The Matador is not a continuous ridge but rather a series of east-west trending, granite peaks separating the Palo Duro Basin to the north from the Midland Basin to the south. However, connecting channels between the two were probably in existence throughout the history of the basins. The largest of the Matador peaks is found in southern Bailey and northern Cochran counties adjacent to the New Mexico state line. Eastward the peaks become smaller and more scattered until the Electra Arch is reached. Faulting is present along the southern flank of part of the ridge and may be more prevalent than realized at present.

The Palo Duro Basin is an asymmetrical basin north of the Matador Ridge, with its deepest part, over 11,000 feet, lying immediately in front of the ridge in Floyd and Motley counties. At its eastern end the basin widens and joins the Hardeman Basin of north-central Texas. The western end shallows gradually as it onlaps the old granite masses of eastern New Mexico. A number of small structures are located within the basin, although there does not appear to be any structural alignment of the long axis of these structures. None has produced oil to date, although a number of shows of oil and gas have been obtained.

The Amarillo Mountains are one of the major structural features of the Panhandle, dividing it into two parts. This granite ridge is apparently a continuation of the Wichita Mountains to the southeast, entering Texas in Wheeler County and extending northwest for more than 100 miles to Moore County. Several faults and minor structures are associated with this uplift, which is aysmmetrical, with a steep northern flank and a more gentle southern one. On the southern side, the Potter County fault parallels the main axis across Potter County; while the Bush Dome is also located in Potter County, with

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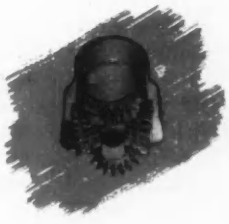

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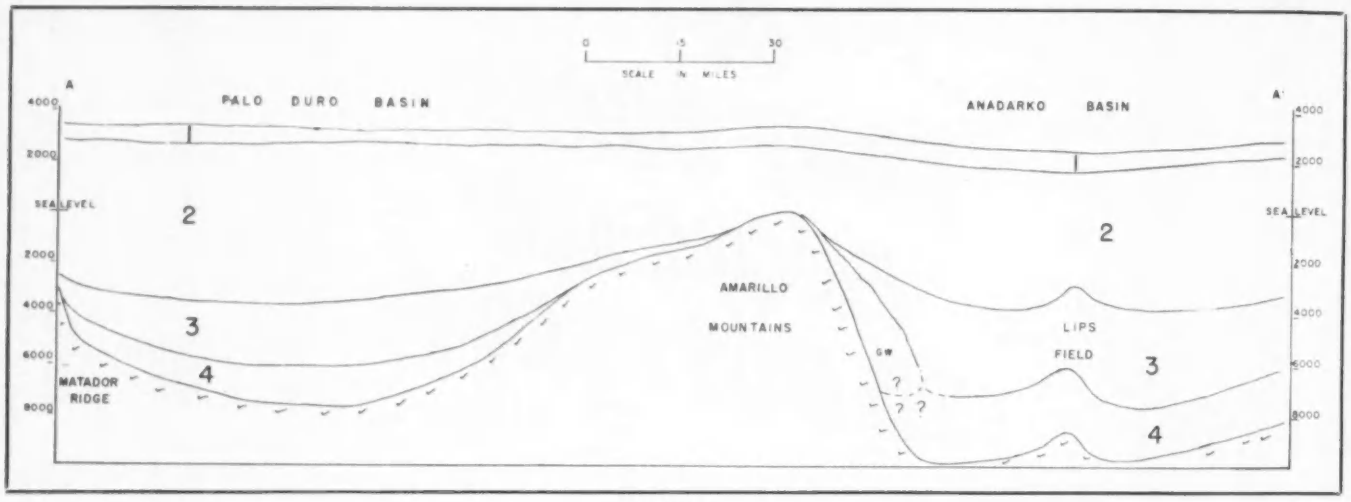


FIGURE 2
Diagramatic cross section through Panhandle from Matador Ridge to Oklahoma line. 1—Triassic and later deposits; 2—Permian formations; 3—Pennsylvanian formations; 4—Pre-Pennsylvanian formations. GW-granite wash.

its long axis nearly parallel to that of the Amarillo Mountains. A subsidiary ridge south of the main axis extends from Potter County to Childress County, with a narrow trough lying between the two ridges. The trough widens at its southeastern end and joins the Hollis Basin of southwestern Oklahoma.

Other faults are believed to lie south of the main axis, but lack of subsurface control makes the structural picture somewhat hazy. It is also somewhat hazy at the northern end of the ridge, where the Panhandle and Hugoton fields meet. West of this junction lies the Bravo Dome, but subsurface control seems to indicate that this is a separate feature and not a continuation of the main ridge. The northern flank of the Amarillo Mountains is very steep, and a fault zone with displacements of several thousand feet is believed to lie along this flank.

The Dalhart Basin is comparatively small and restricted to Hartley and Dallam counties. Connecting channels to the Anadarko Basin are believed to have existed during the Pennsylvanian, and a channel probably also existed between the Bravo Dome and the Amarillo Mountains to the Palo Duro Basin.

Extending south from Oklahoma lies the Keyes Anticline and, south of it, the Stratford Dome and several other smaller domes. These uplifts are not northern extensions of the Amarillo Mountains, but separate features trending toward the ridge and meeting it in Moore County. They separate the Dalhart and Andarko Basins, but channels probably existed between the various domes, connecting the two basins. The Hugoton field, a stratigraphic trap, generally lies to the east of these structures, but its western side extends across them.

Immediately to the north of the Amarillo Mountains lies the western end of the Anadarko Basin, also asymmetrical with a steeply dipping south flank and a more gentle north one. A maximum thickness of over 12,000 feet of sediments accumulated in the central part of the basin near the Oklahoma border. To the west the basin dies out against the Stratford Dome and Keyes Anticline. Several small structural trends are present within the basin, and generally these parallel the main axis of the Amarillo Mountains and Andarko Basin. The Lips field and the newly discovered Haggard area lie on high areas along such trends.

West of the Panhandle during much of the geologic past lay the Pedernal land mass of New Mexico, part of the Ancestral Rockies. This uplift marked the western boundary of the Dalhart and Palo Duro basins, as the various formations wedge-out on the flanks of the old mass. Apparently, the Bravo Dome is an offshoot from this main mass.

Figure 2 is a diagrammatic cross-section from the Matador Ridge on the south to the Oklahoma border on the north, illustrating the structural relationships within the Panhandle.

Stratigraphy and Geologic History

The various stratigraphic units found in the Panhandle may be subdivided into three major units, Pre-Pennsylvanian, Pennsylvanian and Permian. Similarities are found in the three basins, and certain differences are also noticeable. For convenience, the entire area will be discussed under each of these major units, with the geologic history of the area during that time included.

The Pre-Pennsylvanian formations in the Anadarko Basin consist of a basal sand of probable Cambrian age, overlain by limestones and dolomites of Cambrian, Ordovician, Mississippian and possibly Silurian and Devonian ages. Scattered sands and shales are found in this section, but it was dominantly a period of carbonate deposition. As a result of the lack of subsurface control, the exact relationship of these formations to the northern flank of the Amarillo Mountains is somewhat obscure. The Dalhart Basin has a very similar section to the Anadarko Basin but on a smaller scale. The formations in the Dalhart Basin either wedge out to the west or were eroded during later uplift. In the Palo Duro Basin the presence of pre-Mississippian formations, except for a basal sand, is in dispute. Silurian and Devonian formations appear to be absent and the presence of Ellenburger is disputed by many geologists. Formations present consist dominantly of limestones and dolomites with scattered shales and sands. Pre-Pennsylvanian formations are absent on the Matador peaks and wedge out to the north and west on the flanks of the Amarillo Mountains and the New Mexico granite masses.

Apparently the Pre-Pennsylvanian in the Panhandle was a time of relative stability. Several periods of erosion occurred, but deposition was dominantly carbonates, and clastic sediments are thin and poorly developed. The absence of Silurian and Devonian formations is believed to be the result of erosion prior to the deposition of Mississippian sediments. Absence of the Mississippian on the crest of the Matador Ridge and the Amarillo Mountains is also the result of erosion. At one time the formations spread over a much larger area of the Panhandle, and basins and uplifts were only slightly developed, if at all.

The structural features of the Panhandle, as previously discussed, are

largely features of Pennsylvanian times. Arkosic sediments in the Bend and Strawn formations indicate the first uplifting of the Matador Ridge and Amarillo Mountains, accompanied by the downwarping of basinal areas. At this time the older formations were stripped from the rising areas and the clastic material was deposited in the downwarping regions. Bend and Strawn sediments in the Panhandle are dominantly clastic, with limestone deposition becoming more important in certain areas during the Upper Strawn. By Strawn times the basinal and high areas were well defined, with a shale basin in the central part of the Palo Duro and Anadarko Basins grading into an area of limestone deposition around this deeper zone. The northern flank of the Amarillo Mountains is an unusual case, as a tremendous amount of arkose or "granite wash" was deposited in this area throughout Pennsylvanian times.

The same general conditions of sedimentation existed throughout Canyon and Cisco times, with shales being deposited in the deeper parts of the basin and limestones around the edges. A certain amount of reef growth took place, particularly around the Matador peaks. Coarse and fine clastics are less common during this time, since tectonic movement was not as widespread. Erosion still deposited large quantities of arkose on the flanks of the Amarillo Mountains, but on the south flank the amount grew smaller, and Pennsylvanian carbonate deposition encroached higher and higher upon the flanks of the ridge.

The Lower Permian (Wolfcamp) deposits are very similar to Upper Cisco limestones and are widely spread over the area. During the Upper Cisco the basins began to become somewhat restricted, and limestone deposition was more widespread. By upper Wolfcamp times, limestone deposition had spread over the entire area, and the basins had largely filled up and spilled over into the Midland Basin to the south. Shales are still found in these deposits, but the distinction between shale basins and other areas had largely disappeared. Some time during the Lower Wolfcamp or the very latest part of the Upper Cisco, sediments overlapped the top of the Amarillo Mountains and the Matador Ridge, and the long task of burying these massive ridges began. The Upper Wolfcamp contains a great deal of dolomite, as do the overlying Wichita beds. Above this lies the Red Bed Series of shales, sand, dolomite stringers and an evaporite section. As the Matador Ridge was no longer much of a barrier, this evaporite section is probably related to the one of the Midland Basin. Continental deposits make up the remainder of the formations found in the Panhandle. Since the close of the Permian, uplift and erosion have occurred at scattered intervals, and many of the present-day structures found in this area owe their relief to these later movements. Uplift of the Rocky Mountains to the west resulted in a great flood of clastic sediments, covering the Panhandle and burying more deeply the old structures.

Including the surrounding areas of New Mexico and Oklahoma, the Panhandle has a total area of over 50,000 square miles. Of this total, nearly all the oil and gas production is obtained from two fields, the Panhandle and the Hugoton, with an area of less than 3000 square miles. Present oil producing areas include the Panhandle field and extensions, the Hugoton field and extensions, Anton-Irish, Arick, Petersburg and West Petersburg, Lips, Bush Dome, the Haggard area in the Anadarko Basin and the Adams area in the Palo Duro Basin. Prospective areas in the Anadarko Basin include the Holt and Pazourek areas, where The Texas Company and J. M. Huber Corporation seem to have small producing areas.

Present production comes from several types of reservoirs. Petersburg, West Petersburg and Arick produce from reefing around some of the Matador peaks. The Anton-Irish field produces from Clearfork dolomites and is both a structural and porosity trap. The Panhandle field, a structural trap, and the Hugoton field, a stratigraphic trap, produce from dolomites; and in addition the Panhandle field has a great deal of granite wash production. The Lips area produces from sands and limestone reservoirs, while the Haggard area is producing from dolomite and granite wash reservoirs.

Future possibilities of greater production in the Anadarko Basin seem good. Structures similar to those in the Lips field and Haggard area are known, and others will be found. Stratigraphic traps are known to occur on either side of the basin and will be more thoroughly tested in the future. No conditions are known to exist that might prevent the formation of fields such as Ringwood and Elk City, in the Oklahoma part of the Anadarko Basin, and it might be expected that similar fields will be found in this area. Extensions to the Panhandle and Hugoton fields in either subsidiary structures or extensions of the type and area of reservoir rocks are to be expected.

In the Dalhart Basin both reservoir and source beds are present, but the basin is in its infancy as far as exploration is concerned. Conditions similar to those in the Anadarko Basin are present, so fields of similar types, on a smaller scale, should be present.

Considering the area involved, the Palo Duro Basin has been only partially explored. In many counties only two or three deep tests serve as subsurface control for 900 square miles or more. Production to date has been concentrated along the flanks of the Matador Ridge and the Amarillo Mountains. Further reef production in this area seems likely, and recent wells indicate the possibility of stratigraphic traps as well. Although many structures have been drilled in the past and were found to be non-productive, sufficient shows of oil occur to keep interest alive and convince all but the most skeptical that sooner or later production will be obtained from this area.

REFERENCES

J. G. Bartram, W. C. Imbt, E. F. Shea, "Oil and Gas in Arbuckle and Ellenburger Formations, Mid-Continent Region," Bull. A.A.P.G., Vol 34, No. 4 (1950).

Graydon L. Meholin, "Recent Geological Developments in Western Anadarko Basin, Texas and Oklahoma Panhandle," Bull. A.A.P.G., Vol. 34, No. 7 (1950).

Robert Roth, "Paleogeology of Texas Panhandle." Bull. G.S.A., Vol. 60, No. 10 (1950).

Joe M. Sears, "Hollis Basin Holds Promise," World Oil, June, 1952.

E. H. Sellards, "Geology of Texas, Vol. II, Structural and Economic Geology," Bul. 3401, Bureau of Economic Geology, Austin, Texas, 1954.

About the Author

FRED R. HAEBERLE is in charge of exploration in West Texas for J. J. Lynn, Oil Division. Before accepting that position he was with Standard Oil Company of Texas in Houston and Amarillo. Previously, he had been with the Geological Survey of Newfoundland. During World War II, Haeberle served for five years in the Army. Born in Philadelphia, Pa., Haeberle attended the University of Alabama before the war. After the war he transferred to Yale and received a B.S. degree in 1947 and an M.S. degree in 1948 in geology.

Exploratory Drilling Hits All-Time High

AFTER several months of slackening, exploratory drilling bounced back during October making it the most active exploration month in the industry's history. Previously, only three months, all in 1951, accounted for as many as 1000 completed tests. None matched the 1068 recorded this October.

This snapback to more normal levels of exploration came after completed tests dropped to a five-month low in September, as full impact of pipe shortages resulting from the steel strike was felt. Despite the setback, the current exploratory campaign maintained its lead over record 1951, and even widened it some during the month just completed.

October's wells, totaling 1068, gained 188 over the 880 finished during the previous month, and were 90 more than the year's previous high of 978 accredited to July. Of the month's exploratory efforts, 169 tests were completed as commercial oil or gas producers. They amounted to 15.8 percent of the total completed.

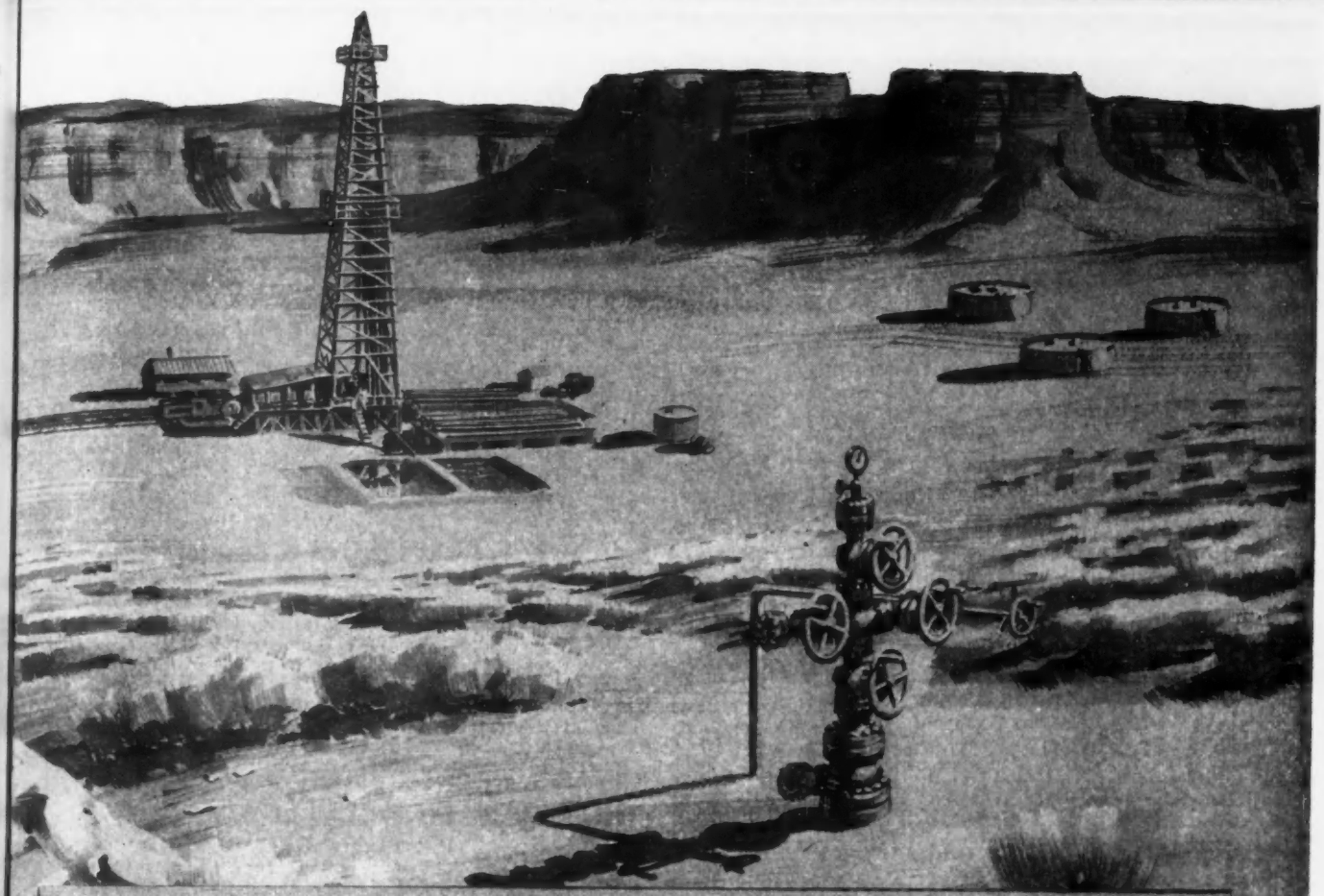
Included in the successes were discoverers of 102 new oil pools. Eighty six of these were new oil field openers, and the remaining 16 found new oil pay strata in producing areas. These finds boosted the year's oil discoveries to 1064, of which 820 were new fields and 244 were new pay horizons. However, this year's oil discoveries have not quite matched last year's in total number. A year ago the bag by this time had been 1088 new pools, 801 fields and 287 pays.

Summary of Results of Exploratory Drilling

ITEM	1952 Oct.	1952 Sept.	TEN MONTHS January-October 1952	1951	Percent Diff.
Oil Discoveries	102	97	1,064	1,088	— 2.2
New Fields	86	71	820	801	+ 2.4
New Pays	16	26	244	287	— 15.0
Distillate Discoveries	13	12	116	69	+ 68.1
New Fields	10	10	100	45	+122.2
New Pays	3	2	16	24	— 33.3
Gas Discoveries	22	15	168	178	— 5.6
New Fields	17	14	135	140	— 3.6
New Pays	5	1	33	38	— 13.2
Total Discoveries	137	124	1,348	1,335	+ 1.0
Extensions to Fields	32	18	293	245	+ 19.6
Oil Fields	27	16	249	191	+ 30.4
Distillate Fields	2	.....	8	14	— 42.9
Gas Fields	3	2	36	40	— 10.0
Total Prod. Tests	169	142	1,641	1,580	+ 3.9
Dry Holes	899	738	7,491	7,191	+ 4.2
Wildcats	887	730	7,267	6,872	+ 5.7
New Pays	.....	.....	11	12	— 8.3
Outposts	12	8	213	307	— 30.6
Total Expl'tory Tests	1,068	880	9,132	8,771	+ 4.1
Percent Productive	15.8	16.1	18.0	18.0	.....
Percent Dry	84.2	83.9	82.0	82.0	.....

Results of Exploratory Drilling in October and First 10 Months, 1952-1951, by Districts

State or District	MONTH OF OCTOBER, 1952														FIRST TEN MONTHS, 1952															
	Productive Tests									Total Productive	Unproductive Tests			Total Exploratory Tests	Productive Tests									Total Productive	Unproductive Tests			Total Dry		Total Exploratory Tests	
	New Fields			New Pays			Extensions								New Fields			New Pays			Extensions									
	Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas		Wildcats	New Pays	Outposts		Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas	10 Mo. 1952	10 Mo. 1951	Wildcats	New Pays	Outposts	10 Mo. 1952	10 Mo. 1951	10 Mo. 1952	10 Mo. 1951
Alabama											6			6	1		1							2	3	31			31	19	33	22
Arizona											1			1												2			2	3	2	3
Arkansas			1	2						3	15			18	9		2	2		2	1			16	18	91		1	92	80	108	98
California	2		1	1			3			7	37		3	47	27	1	7	19			24		2	80	67	316	2	30	348	403	428	470
Colorado	1					1				2	32			34	10	1	5	3		3	2		1	25	10	181		2	183	102	208	112
Florida											1			1												7			7	3	7	3
Idaho																													1		1
Illinois	3			2			6			11	48			59	22		1	17		2	43			85	89	482			482	619	567	708
Indiana	3		1				4			8	39			47	18		2	2			16			38	47	290		2	292	355	330	402
Kansas	17		2							19	97			116	106	1	10	7			1			125	154	743			743	666	868	820
Kentucky	4									4	10			14	24			1			4			29	28	104			104	159	133	187
Louisiana	4	2	2	1	2	1		1		13	51			64	32	23	5	13	5	1	3	1	2	85	75	311	1	3	315	298	400	373
North Louisiana	4	1	1							6	40			46	13	5	4	8	3		2		1	36	33	181		3	184	188	220	221
South Louisiana		1	1	1	2	1		1		7	11			18	19	18	1	5	2	1	1	1	1	49	42	130	1		131	110	180	152
Michigan	1		1							2	24			26	15		2	6		3	4		1	31	16	202			202	267	233	283
Mississippi	2			1						3	12		1	16	10	2		3		1	3			19	20	132		4	136	131	155	151
Missouri																										16			16	1	16	1
Montana	3									3	15			18	6		1				2			9	5	66		2	68	46	77	51
Nebraska	1									1	25			26	9		2	1			2			14	18	108	1	2	111	73	125	91
Nevada																													2		2
New Mexico	1		2	2						5	15			20	18	2	12	9	1	3	7			52	31	101	1	1	103	71	155	102
North Dakota											4			4	4						5			9	1	10			10	7	19	8
Ohio									1	1	1			2			1				2		7	10	6	26			26	22	36	28
Oklahoma	11	1	1				1		1	15	60			75	73	9	12	29	1	1	35	1	4	165	131	613			613	551	778	682
Pennsylvania																									1	2			2		2	1
South Dakota											2			2												5			5		5	
Tennessee																														6		6
Texas	32	7	5	7	1	3	13	1	1	70	363		8	441	431	59	69	127	9	17	92	6	19	829	828	3268	6	164	3438	3173	4267	4001
Dist. 1 S. Central		2					4			6	44			50	15	6	1	1		1	7		1	32	31	284		6	290	188	322	219
Dist. 2 Middle Gulf	1	1	1	1			1			5	28			33	19	16	10	7			9	3	8	72	83	229	1	14	244	209	316	292
Dist. 3 Upper Gulf	1	1	1	2	1	2	2	1	1	12	28		5	45	24	17	8	45	6	9	5	3	6	123	91	262		25	287	233	410	324
Dist. 4 L. Gulf-S.W.	1	1	2	2		1	2			9	37			46	29	11	26	13	2	4	7		3	95	112	324	3	11	338	333	433	445
Dist. 5 E. Central	1									1	13			14	4	2					1			7	21	103		2	105	130	112	151
Dist. 6 Northeast											12			12	5	2	1	7			2			17	22	107		2	109	82	126	104
Dist. 7-B N. Cent.	13									13	72			85	139	2	12	7	1	2	4			167	195	766		9	775	828	942	1023
Dist. 7-C W. Cent.	3	1		1			1			6	27			33	58	1	3	8		1	15			86	68	311		3	314	261	400	329
Dist. 8 West	4	1		1			3			9	26		1	36	49	2	1	18			29		1	100	86	327	1	5	333	324	433	410
Dist. 9 North	8		1							9	75		2	86	89		6	21			13			129	113	534	1	83	618	555	747	668
Dist. 10 Panhandle											1			1			1							1	6	21		4	25	30	26	36
Utah											6			6							1			1	2	44			44	21	45	23
West Virginia															1									1	2	3			3	2	4	4
Wyoming	1		1							2	23			25	4	2	3	5			2			16	28	113		2	115	110	131	138
Total U. S.	86	10	17	16	3	5	27	2	3	169	887		12	1068	820	100	135	244	16	33	249	8	36	1641	1580	7267	11	213	7491	7191	9132	8771



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ARKANSAS—NEW OIL PAYS

Union County, Hibank area. McAlester Fuel Co.'s H. D. Pendleton A-1, C SE SW NE 24-18s-15w, ½-mile northwest of production, flowed 100 barrels from Graves sand, Upper Cretaceous 2556-58 feet, 12/64-inch, 32-gravity, completed 10-15-52, TD 3555.

Schuler field. Carter Oil Co.'s E. M. Wooley 1, NE NE 28-18s-17w, pumped 45 barrels oil and 21 barrels water from Tuscaloosa lime, Upper Cretaceous 3104-08 feet, 34.9-gravity, completed 10-8-52, TD 4204.

ARKANSAS—NEW GAS FIELD

Johnson County. Pure Oil Co.'s Low-Gap Unit 4-A, in 6-11n-23w, flowed 1.0 million from Hale sand, Pennsylvanian 2352-92 feet, open, completed 10-1-52, TD 2537.

CALIFORNIA—NEW OIL FIELDS

Kern County, Bellevue, West field. Standard Oil Co.'s Karpe 53, in 34-29s-26e, pumped 95 barrels oil and 5 barrels water from Lower Stevens sand, Miocene 8790-8810 feet, 30-gravity, completed 10-23-52, TD 9466.

Unnamed field. Oceanic Oil Co.'s General American 1, in 16-32s-23e, pumped 175 barrels from Republic sand, Pliocene 4312-30 feet, 22-gravity, completed 10-22-52, TD 4371.

CALIFORNIA—NEW OIL PAY

Kern County, Tunis Creek field. D. K. Partnership's Corral 183-29, in 29-11n-18w, pumped 43 barrels from 2207-40 feet, 14/64-inch, 32.7-gravity, completed 10-7-52, TD 2460.

CALIFORNIA—OIL FIELD EXTENSIONS

Kern County, Los Lobos field. Richfield Oil Corp.'s CCMO 78-20, in 20-11n-22w, west extension, flowed 185 barrels from Pliocene sand 6771-6819 feet, 26/64-inch, 18.5-gravity, completed 10-16-52, TD 7259.

Lost Hills field. Richfield Oil Corp.'s Lost Hills C-11, in 13-26s-20e, northwest extension, flowed 145 barrels from W-3 sand, Pliocene 2966-3022 feet, 32/64-inch, 24-gravity, completed 10-9-52, TD 3024.

Unnamed field. Trico Oil and Gas Co.'s Mulick 1, in 4-30s-29e, north extension, flowed 288 barrels from Lower Jewett-Vedder sand, Miocene 4970-5000 feet, 10/64-inch, 41-gravity, completed 10-16-52, TD 5474.

CALIFORNIA—NEW GAS FIELD

Humbolt County, Eureka, East field. The Texas Co.'s Little A-1, SW NE 24-3n-1w, flowed 4000 from 5400-5795 feet, ⅜-inch, completed 10-20-52, TD 6000.

COLORADO—NEW OIL FIELD

Washington County. Amerada Petroleum Corp's Bertha Sharp 1, NE SE SW 26-1s-55w, pumped 20 barrels from "D" sand, Upper Cretaceous 4778-82 feet, completed 10-16-52, TD 5224.

COLORADO—NEW GAS PAY

Garfield County. Greenbrier Oil Co. & Mendota Oil Co.'s Deacon-Brown 1, SE SE NE 35-5s-102w, flowed 2 million from Morrison sand, Jurassic 6150-60 feet, completed 10-25-52, TD 6815.

ILLINOIS—NEW OIL FIELDS

Clinton County, Posey, East field. O. Pattillo's M. Wessel 1, NE NW SW 15-1n-2w, pumped 17 barrels from Devonian lime, Devonian 2738-46 feet, completed 10-28-52, TD 2767.

Randolph County, Tilden field. Jet Oil Co.'s C. Easdale 1, SE NE NW 16-4s-5w, pumped 65 barrels from Silurian lime, Silurian 2147 feet, completed 10-7-52, TD 2228.

Washington County, Posen field. E. A. Obering's Kitowski 1, NE SE NE 21-3s-2w, pumped 182 barrels from Trenton lime, Trenton 3900-34 feet, completed 10-21-52, TD 3935.

ILLINOIS—NEW OIL PAYS

Fayette County, Louden field. Carter Oil Co.'s C. McCollum 5-D, Old Well Worked Over, C NW SW 2-8n-3e, pumped 54 barrels oil and 3 barrels water from Carper sand, Mississippian 2830 feet, completed 10-21-52, TD 3104.

Marion County, Patoka, East field. Talbot & Beech's Davidson 1-T, SE NE 34-4n-1e, pumped 172 barrels oil and 80 barrels water from Devonian lime, Devonian 2950-52 feet, completed 10-14-52, TD 4178.

ILLINOIS—OIL FIELD EXTENSIONS

Madison County, Livingston, South field. Schenk Drilling Co.'s Leitch 1, NW NE NE 34-6n-6w, 1-mile southeast extension, pumped 15 barrels from Pennsylvanian sand, Pennsylvanian 561-66 feet, completed 10-14-52, TD 566.

Richland County, Passport, South field. Modoff & Anderson's H. Gray 1, NE NE NE 18-4n-9e, Old Well Worked Over, ¾-mile north extension, pumped 70 barrels oil and 3 barrels water from Cypress sand, Mississippian 2694-2705 feet, completed 10-21-52, TD 3123.

Wabash County, Allendale field. George & Wrather's H. A. Fox 1, SW NW NW 26-1n-12w, ¾-mile extension, pumped 28 barrels from Tar Springs sand, Mississippian 1669-78 feet, completed 10-21-52, TD 2352.

Wayne County, Goldengate, West field. Collins Brothers' Jones 1, NE NW NW 5-2s-9e, 1-mile north extension, pumped 107 barrels oil and 75 barrels water from Bethel sand, Mississippian 3097-3100 feet and Aux Vases sand, Mississippian 3222-46 feet, completed 10-21-52, TD 3249.

White County, Centerville field. D. B. Lesh's J. P. Jones 1, SE NW NE 12-4s-9e, ¾-mile southeast extension, pumped 225 barrels from Lower O'Hara lime, Mississippian 3317-23 feet, completed 10-14-52, TD 3410.

New Harmony Consolidated field. Skiles Oil Co.'s Owen Brown 1, SE NW 29-4s-14w, ¾-mile extension, pumped 7 barrels from Tar Springs sand, Mississippian 2340-46 feet, completed 10-28-52, TD 2346.

INDIANA—NEW OIL FIELDS

Gibson County. Al Morris Drilling Co.'s Frank McRoberts 1, in Mil Don 89-1s-10w, swabbed 150 barrels from Benoist sand, Mississippian 1645-51 feet, TD 1651.

Unnamed field. Ashland-Buchman-O'Neal's Henry M. Kissel 1, SE SE NE 34-2s-10w, pumped 105 barrels from Aux Vases sand, Mississippian 1935-50 feet, TD 2078.

Unnamed field. Illinois Mid-Continent's James Dunlap 1, NE SW SW 28-1s-10w, pumped 189 barrels from O'Hara lime, Mississippian 1876-80 feet, TD 1950.

INDIANA—OIL FIELD EXTENSIONS

Gibson County. E. J. Cunningham's R&B Wilder 1, NW NW SE 17-2s-9w, ¾-mile extension, pumped 75 barrels from Aux Vases lime, Mississippian 1724-29 feet, TD 1729.

Knox County, Monroe City field. Lewis & Clemens Drilling Co.'s Jacob B. Hancock 1, SE NW NW 21-2n-8w, ¾-mile extension, swabbed 31 barrels oil and 29 barrels water from Rosiclare lime, Mississippian 1460-64 feet, TD 1464.

Monroe City field. Lohmann & Johnson's Nannie Frank 1, NE NW NE 28-2n-8w, pumped 10 barrels from O'Hara lime, Mississippian 1396-1400 feet, TD 1400.

Posey County, Mt. Vernon Consolidated field. Carter Oil's Norton & Lucille Rowe 1, E½ NE SW 24-7s-14w, ¾-mile southeast extension, swabbed 44 barrels from Lower Renault lime, Mississippian 2920-27 feet, TD 3151.

INDIANA—NEW GAS FIELD

Pike County. G. C. Schoonmaker's Wm. P. Dearing 1, SW NE SW 23-1s-8w, flowed 3 million from Pennsylvanian sand 919-29 feet, TD 1533.

KANSAS—NEW OIL FIELDS

Barton County. Bay Petroleum's Hitchman 1, SW SE NE 11-17s-13w, pumped 75 barrels from Arbuckle lime, Ordovician 3338-40 feet, TD 3340.

Unnamed field. Sohio Petroleum Corp.'s Cook 1, SW SW NE 8-19s-13w, pumped 190 barrels from Lansing lime, Pennsylvanian 3347-54 feet, TD 3469.

Cowley County. Duke & Wood's Rowe 1, NE NW SE 31-33s-6e, pumped 6 barrels from Layton sand, Pennsylvanian 2182-84 feet, TD 2187.

Decatur County, Monaghan field. E. K. Carey Drilling Co. & H. E. Zoller's Monaghan 1, SW SW SW 15-2s-27w, pumped 24 barrels oil and 48 barrels water from Lansing lime, Pennsylvanian 3514-18 and 3528-34 feet, TD 4015.

Ellis County, Beilman field. Jones, Shelburne & Farmer's Beilman 1, SW SW SW 24-15s-18w, pumped 75 barrels from Arbuckle lime, Ordovician 3490-3500 feet, TD 3500.

Graham County, Michelson field. Jones, Shelburne & Farmer's Michelson 1, NW NW SE 27-8s-22w, pumped 278 barrels from Arbuckle lime, Ordovician 3759-75 feet, TD 3775.

Harper County, Bluff Creek field. The Texas Co.'s Baker 1, NE SW NW 24-34s-5w, pumped 26 barrels oil and 13 barrels water from Kansas City lime, Pennsylvanian 3938-43 feet, TD 5099.

Marion County. P. L. Edward's Spangler 1, SE SW SW 2-22s-4e, pumped 10 barrels oil and 50 barrels water from Mississippi lime, Mississippian 2300-20 feet, TD 2320.

Rooks County, McMullen field. Jones, Shelburne & Farmer's McMullen 1, NE NE SW 33-8s-17w, pumped 365 barrels from Arbuckle lime, Ordovician 3454-59 feet, TD 3459.

Unnamed field. Trans-Era Petroleum, Limited's Schneider 1-A, NW NW SE

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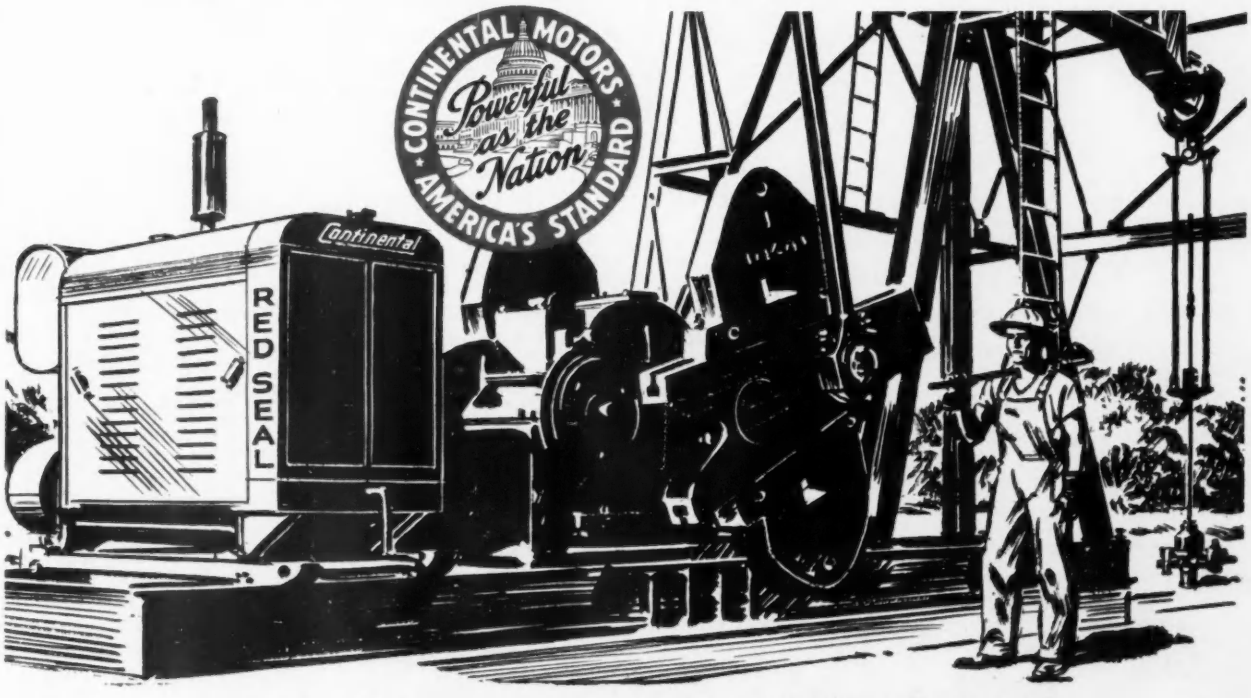

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30-10s-20w, pumped 178 barrels from Arbuckle lime, Ordovician 3667-73 feet, TD 3673.

Russell County, Fay field. D. R. Lauck's Shaffer 1, NE NE SW 2-12s-15w, pumped 141 barrels from Arbuckle lime, Ordovician 3238-50 feet, TD 3250.

Stafford County, Hickman field. Petroleum Inc.'s Scharts 1-B, SW SW SE 34-21s-14w, pumped 46 barrels from Lansing lime, Pennsylvanian 3567-75 feet, TD 3825.

Koelsch field. White Eagle Oil Co.'s Koelsch 1, SW SW SW 24-24s-14w, potentialed 2583 barrels from Lansing lime, Pennsylvanian 3750-58 feet, TD 4290.

Unnamed field. Heathman & Co.'s Spangenberg 1, SW SW SE 16-22s-12w, pumped 223 barrels from Arbuckle lime, Ordovician 3687-95 feet, TD 3695.

Unnamed field. Petroleum, Inc. et al's Walls 1, SE NE SE 29-22s-13w, pumped 505 barrels from Lansing lime, Pennsylvanian 3641-49 feet, TD 3940.

Unnamed field. Westgate-Greenland's Weirauch 1, SW NE NW 29-21s-14w, pumped 25 barrels from Arbuckle lime, Ordovician 3777-85 feet, TD 3818.

Trego County. Jones, Shelburne & Farmer's Groff 1, SW SW SW 26-14s-21w, pumped 78 barrels from Conglomerate 3822-25 and 3828-32 feet, TD 3865.

KANSAS—NEW GAS FIELDS

Stafford County. Alpine Oil & Royalty Co.'s Hill 1, NE NW NW 11-23s-12w, flowed 4.5 million from Lansing lime, Pennsylvanian 3448-80 feet, TD 3637.

Unnamed field. Lindas Oil Co.'s Seibert 1, NE NE SE 31-24s-15w, flowed 1.7 million from Conglomerate 4177-4202 feet, open, TD 4610.

KENTUCKY—NEW OIL FIELDS

Daviess County. Wm. E. Styles' Andrew Donovan 1, SW NW 19-Q-27, swabbed 68 barrels from Aux Vases lime, Mississippian 1776-84 feet, TD 1793.

Hopkins County. Geo. Hoffman-W. G. Reynolds & Basin Drilling's Lila Hobgood-Lafitte Community 1, SW SE SW 8-L-26, pumped 32 barrels from Aux Vases lime, Mississippian 2666-73 feet, TD 2775.

Union County, East Shawnee-Town field. Eureka Operating Co. et al's T. T. Richards 1, SE SW NE 19-O-17, pumped 32 barrels oil and 20 barrels water from Tar Springs sand, Mississippian 1939-54 feet, TD 2013.

Webster County, Bald Knob field. Iley B. Browning & Sons' Clyde Samples 6, in 19-N-23, pumped 168 barrels from Waltersburg sand, Mississippian 1747-62 feet, TD 1762.

NORTH LOUISIANA—NEW OIL FIELDS

Caddo Parish. Caddo Oil Co., Inc.'s Kuhn 1, in 10-20n-16w, pumped 70 barrels from Tokio sand, Upper Cretaceous 2253-57 feet, completed 10-27-52, TD 2350.

Unnamed field. The Texas Co.'s J. C. Williams, Jr. 1, in 2-15n-15w, pumped 5 barrels from Anhydrite Zone 4850-58 feet, completed 10-14-52, TD 9407.

Catahoula Parish, Mitten Lakes, West field. Hunt Oil Co. & Gulf Refining Co.'s Louisiana Delta Hardwood Lumber Co. 70, C SE SW 32-4n-5e, flowed 133 barrels from Wilcox sand, Eocene 6510-14 feet, 8/64-inch, 45-gravity, completed 10-15-52, TD 6992.

LaSalle Parish, Long Slough field. Hunt Oil Co. et al's Louisiana Delta Hardwood Lumber Co. 73, C SW NE 23-5n-4e, flowed 111 barrels from Wilcox sand, Eocene 5193-99 feet, 8/64-inch, 45-gravity, completed 10-6-52, TD 6006.

NORTH LOUISIANA—NEW DISTILLATE FIELD

Bossier Parish, Ivan field. Carter Oil Co.'s Crystal 1, NWc SW NE 33-21n-11w, flowed 238 barrels and 2.3 million from Taylor sand, Upper Cretaceous 9706-20 feet, 12/64-inch, 54.6-gravity, completed 9-7-52, TD 9817.

NORTH LOUISIANA—NEW GAS FIELD

Caddo Parish, Greenwood, East field. O. G. Martin & Finn Myrdahl et al's Herold-Wallace 1, SW SW 2-17n-15w, flowed 5 million from Paluxy sand, Lower Cretaceous 2520-23 feet, open, completed 10-15-52, TD 6300.

SOUTH LOUISIANA—NEW OIL PAY

Lafourche Parish, Clovelly field. Humble Oil and Refining Co.'s Lafourche Land Co. 4, in 32-18s-22e, flowed 308 barrels from Miocene sand 12,112-132 feet, ⅛-inch, 30.1-gravity, completed 10-9-52, TD 12,250.

SOUTH LOUISIANA—NEW DISTILLATE FIELD

Vermillion Parish. Austral Oil Exploration Co.'s Vincent & Welch 1, 12-13s-2w, flowed 88 barrels distillate and 4.4 million from 11,797-804 feet, ¼-inch, 47.5-gravity, completed 10-12-52, TD 13,803.

SOUTH LOUISIANA—NEW DISTILLATE PAYS

Cameron Parish, Cameron field. Stanolind Oil and Gas Co.'s C. F. Henry 2-A, in

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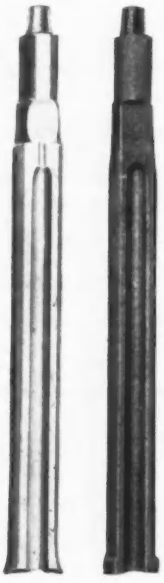

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30-14s-9w, flowed 40 barrels distillate and 2 million from Miocene sand 9143-48 feet, 10/64-inch, 48.1-gravity, completed 10-6-52, TD 11,542.

Lafourche Parish, Golden Meadow, East field. Humble's LL&E 6-C, in 30-19s-23e, flowed 53 barrels distillate and 1.4 million from Miocene sand 10,718-722 feet, ¼-inch, 59.7-gravity, completed 10-5-52, TD 10,846.

SOUTH LOUISIANA—DISTILLATE FIELD EXTENSION

Cameron Parish, Deep Lake field. The Superior Oil Co.'s Rockefeller State Lease 2038-2, in 3-16s-3w, 1-mile northeast extension, flowed 135 barrels distillate and 8.8 million from Miocene sand 10,974-984 feet, 22/64-inch, 50.4-gravity, completed 10-12-52, TD 13,998.

SOUTH LOUISIANA—NEW GAS FIELD

Jefferson Parish. Humble's State Lease 819 1-D, Block 30, West Delta area, ungauged from 2484-93 feet, completed 8-18-52, TD 2856.

SOUTH LOUISIANA—NEW GAS PAY

Assumption Parish, East Lake Verret field. Humble's State Lease 1-1723, in 33-13s-13e, ungauged from Miocene sand 12,266-280 feet, completed 10-8-52, TD 12,962.

MICHIGAN—NEW OIL FIELD

Allegan County. Louis Zellman's Loebel 1, SE SE NE 13-1n-13w, Trowbridge Township, pumped 12 barrels from Traverse lime, Devonian 1505-08 feet, TD 1508.

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MICHIGAN—NEW GAS FIELD

Newaygo County. Sun Oil Co.'s Graham 1, NW SW NE 17-11n-11w, Ensley Township, flowed 0.6 million from Stray-Marshall sand, Misssissippian 877-93 feet, TD 3099.

MISSISSIPPI—NEW OIL FIELDS

Adams County, Lake Lucile field. Humble's N. H. Breaux et al 1-C, in 11-4n-3w, flowed 30 barrels from Lower Wilcox sand, Eocene 6844-48 feet, ¼-inch, 46-gravity, completed 10-19-52, TD 7300.

Wayne County, Yellow Creek, North field. S. B. Daws, Ralph Stanley & Lyle Cashion's Eddie G. Creagh 1, NE SW 19-10n-7w, pumped 140 barrels from Morrison sand 4736-46 feet, 19-gravity, completed 10-12-52, TD 5214.

MISSISSIPPI—NEW OIL PAY

Lincoln County, West Lincoln field. Roeser & Pendleton, Inc.'s Board of Supervisors A-5, C SE NE SW 16-6n-6e, flowed 152 barrels from Lower Tuscaloosa sand, Upper Cretaceous 10,603-611 feet, ⅛-inch, 40.5-gravity, completed 10-1-52, TD 10,672.

MONTANA—NEW OIL FIELDS

Big Horn County, Nine Mile area. George J. Greer's Kendrick 2, NE NW NW 6-1s-35e, pumped 150 barrels from Tensleep sand, Pennsylvanian 4558-88 feet, 20.5-gravity, completed 10-4-52, TD 4588.

Dawson County. The Texas Co.'s NPRR-NCT 8-G-1, NE NE 7-16n-54e, pumped 114 barrels oil and 28 barrels water from Devonian lime 7846-70 feet, completed 10-1-52, TD 8131.

Toole County. Ponder, Pattie & Stewart's Peck 1, NW SE NW 4-37n-4w, pumped 150 barrels from Moulton sand, Mississippian 2482 feet, completed 10-12-52, TD 2519.

NEBRASKA—NEW OIL FIELD

Morrill County. Gaylord H. Chizum's J. L. Hart 1, SW SW SW 6-18n-49w, pumped 103 barrels from "J" sand, Upper Cretaceous 4006-32 feet, completed 10-14-52, TD 4047.

NEW MEXICO—NEW OIL FIELD

Lea County. Gulf Oil Corp.'s Lea-State AN-1, in 27-13s-33e, flowed 998 barrels from Pennsylvanian sand 9580-9625 feet, ¾-inch, 43-gravity, completed 10-1-52, TD 13,440.

NEW MEXICO—NEW OIL PAYS

Lea County, Mescalero field. Cities Production Co.'s State AD-1, in 22-10s-32e, flowed 2174 barrels from Devonian lime, Devonian 9880-9900 and 9908-13 feet, 1-inch, 44.5-gravity, completed 10-24-52, TD 9916.

San Juan County, Hogback field. Stanolind Oil & Gas Co.'s USG-19-13, NW SW NE 19-29n-16w, flowed 147 barrels from Mississippian lime 6930-7000 feet, 69.5-gravity, completed 10-13-52, TD 7453.

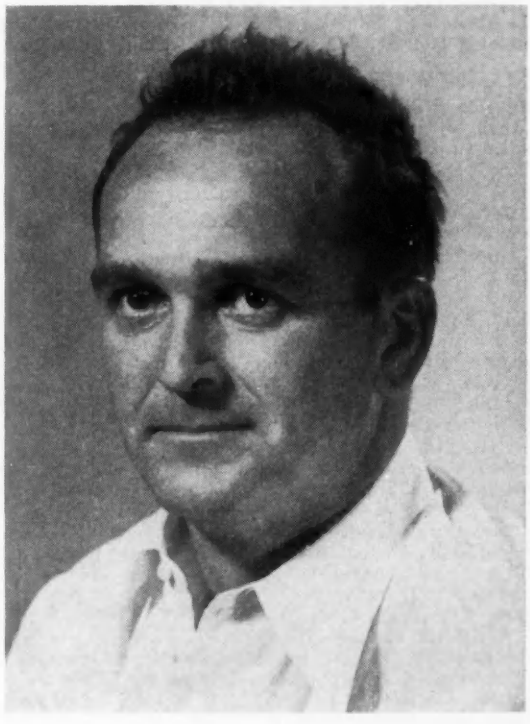
NEW MEXICO—NEW GAS FIELDS

Rio Arriba County. Barron Kidd's Abraham 9, SE NW NE 30-30n-6w, flowed 8 million from Mesaverde sand, Upper Cretaceous 5020-5793 feet, completed 9-14-52, TD 5793.

San Juan County. Blackwood & Nichols' Unit 1, NW SE NE 27-31n-7w, flowed 0.5 million from Dakota sand, Upper Cretaceous 7860-7995 feet, completed 10-28-52, TD 8095.

OHIO—GAS FIELD EXTENSION

Stark County, Sandyville field. Ed Obermiller et al's Charles Marks 1, Section 1, Tuscarawas Township, flowed 0.3 million



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from Clinton Shell lime, Silurian 4135-45 feet, completed 10-9-52, TD 4278.

OKLAHOMA—NEW OIL FIELDS

Beaver County. Deep Rock Oil Corp's Shadden A-1, C NW NE 25-3n-24ecm, pumped 94 barrels from Morrow sand, Pennsylvanian 7316-22 feet, 39.2 gravity, TD 8377.

Garvin County. Shell Oil Co.'s G. L. Rose 1, SE NE SW 6-1n-3w, flowed 288 barrels from Pennsylvanian sand 3647-57 and 3661-83 feet, ¾-inch, 30-gravity, TD 4973.

Unnamed field. Superior Oil Co.'s Slay 1, C SW SW 27-4n-4w, flowed 103 barrels from Hart sand, Pennsylvanian 8530-42 and 8557-62 feet, 11/64-inch, 44.3-gravity, TD 9900.

Grant County. Parker Drilling Co.'s J. T. Mordy 1, NE NE SW 12-28n-6w, pumped 52 barrels from Lower Layton sand, Pennsylvanian 3992-4003 feet, TD 5471.

Logan County. Ryan Oil's Griffin Heirs 1, SW NE SE 34-17n-1e, flowed 48 barrels from 1st Wilcox sand, Ordovician 5105-08 feet, 16/64-inch, TD 5255.

McClain County. The Texas Co.'s H. P. Morehead 1, C SE SW 25-7n-3w, flowed 154 barrels from 1st Bromide sand, Ordovician 8850-60 feet, 42-gravity, completed 10-52, TD 9750.

Okfuskee County, West Hilliby area. Wilcox Oil's William Diehl 1, NW NW NE 33-13n-7e, Old Well Worked Over, pumped 49 barrels from Dutcher sand, Pennsylvanian 3683-93 feet, TD 4250.

Unnamed field. R. S. Tarr & R. W. Simpson, Jr.'s Allen Trust 1, NW NE SW 14-13n-9e, pumped 20 barrels oil and 30 barrels water from Union Valley-Cromwell sand, Pennsylvanian 3086-3120 feet, 38-gravity, TD 3137.

Oklahoma County, Southwest Fallis field. Robert M. Jordan's Mitchell 1, SE NE SE 1-14n-1e, flowed 170 barrels oil and 20 barrels water from Cleveland sand, Pennsylvanian 3897-3912 feet, 42-gravity, TD 3980.

Pottawatomie County. J. F. Smith's Flanigan 1, SW SW NW 17-7n-2e, flowed 150 barrels from Chimney Hill lime, Silurian 5732-48 feet, ½-inch, 40.4-gravity, TD 6234.

Unnamed field. Richard S. Rheem et al's Prater 1, NW NE SW 23-9n-3e, pumped 40 barrels oil and 12 barrels water from 1st Wilcox sand, Ordovician 5306-09 feet, 37-gravity, TD 5421.

OKLAHOMA—OIL FIELD EXTENSION

Garvin County, Sholem Alechem field. Schermerhorn Oil Corp.'s Corley 1, SW NE SW 30-1n-3w, north extension, pumped 105 barrels from Tussy sand, Pennsylvanian 3391-3428 feet, 23.5-gravity, TD 6041.

OKLAHOMA—NEW DISTILLATE FIELD

Canadian County. Sinclair Oil & Gas Co. et al's Emma Huchteman 1, NW NE SE 14-12n-7w, flowed 47 barrels distillate and 10.3 million from 2nd Wilcox sand, Ordovician 10,318-48 feet, 9/16-inch, 53-gravity, TD 11,700.

OKLAHOMA—NEW GAS FIELD

Garfield County. Panda Drilling Co.'s Cassady 2, NW NW SE 23-22n-3w, flowed 3.3 million from Hodges sand, Permian 1422-34 feet, TD 2372.

OKLAHOMA—GAS FIELD EXTENSION

Lincoln County, Sporn, Southeast field. Service Drilling Co.'s McClain-Johnson 1, NW NW NE 34-17n-3e, south extension, flowed 2 million from Lower Skinner sand, Pennsylvanian 4038-44 feet, TD 4222.

TEXAS DISTRICT 1—OIL FIELD EXTENSIONS

Frio County, Big Foot field. D. J. Moss & Big Six Drilling Co.'s T. B. Stewart 1, H. Fabian Survey 1129, flowed 21 barrels from Navarro sand, Upper Cretaceous 3690-3727 feet, 12/64-inch, 42-gravity, completed 10-7-52, TD 3727.

Big Foot field. Lewis Oil Co.'s C. R. Thompson 1, F. Volk Survey 132, northwest extension, flowed 68 barrels from Olmos "B" sand, Upper Cretaceous 3144-93 feet, 10/64-inch, 44-gravity, completed 9-26-52, TD 3193.

Big Foot field. Lewis Oil Co.'s Gordon E. Tate 1, Daniel Matler Survey, Section 130, ¾-mile west extension, flowed 56 barrels from Olmos "B" sand, Upper Cretaceous 3097-152 feet, 10/64-inch, 44-gravity, completed 10-12-52, TD 3152.

Big Foot field. Lewis Oil Co.'s W. P. Jones 1, John Hoffman Survey 138, west extension, flowed 75 barrels from Olmos "B" sand, Upper Cretaceous 3164-218 feet, 10/64-inch, 44.1-gravity, completed 10-4-52, TD 3218.

TEXAS DISTRICT 1—NEW DISTILLATE FIELDS

McMullen County. Alaska Steamship Co. & Newman Bros. Drilling Co.'s South Texas Syndicate AA-5, Section 15, BS&F Survey, flowed 426 barrels distillate and 32 million from Wilcox sand, Eocene 5474-80 feet, open, completed 9-24-52, TD 6176.

Unnamed field. Alaska Steamship & Newman Bros.'s South Texas Syndicate G-3, Section 13, BS&F Survey, flowed 270 barrels distillate and 17 million from Wilcox sand, Eocene 5313-19 feet, open, 72-gravity and flowed 360 barrels distillate and 18 million from Wilcox sand, Eocene 6137-52 feet, open, 64-gravity, completed 10-18-52, TD 6152.

TEXAS DISTRICT 2—NEW OIL FIELD

Jackson County. Sam G. Harrison's Edwin L. Whisler et al 1, John Davis Survey, flowed 69 barrels from Frio sand, Oligocene 6467-69 feet, 5/64-inch, 44.3-gravity, completed 10-26-52, TD 6609.

TEXAS DISTRICT 2—NEW OIL PAY

De Witt County, Helen Gohlke, West field. Kirkwood & Co., W. F. Seager, Weaver & Sharp's W. H. Kuester et al 2, P. F. Breeden Survey, Old Well Worked Over, flowed 33 barrels from Yegua sand, Eocene 5374-76 feet, ⅛-inch, 45-gravity, completed 9-28-52, TD 5387.

TEXAS DISTRICT 2—OIL FIELD EXTENSION

De Witt County, Helen Gohlke, West field. Kirkwood & Co., W. F. Seager, Weaver & Sharp's W. H. Kuester et al 4, P. F. Breeden Survey, southwest extension, flowed 47 barrels from Yegua sand, Eocene 5369-76 feet, 5/32-inch, 45-gravity, completed 10-8-52, TD 8200.

TEXAS DISTRICT 2—NEW DISTILLATE FIELD

Calhoun County. Western Natural Gas Co.'s State-San Antonio Bay Tract 49-1, Tract 49, San Antonio Bay, flowed 272 barrels distillate and 3.4 million from 8578-8644 feet, open, 56.9-gravity, completed 10-26-52, TD 9515.

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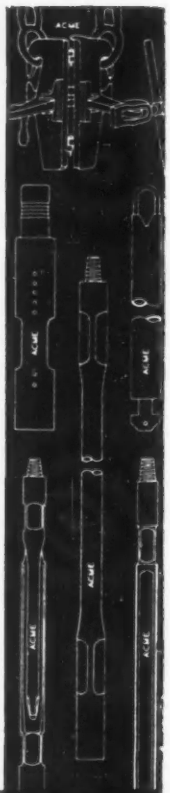

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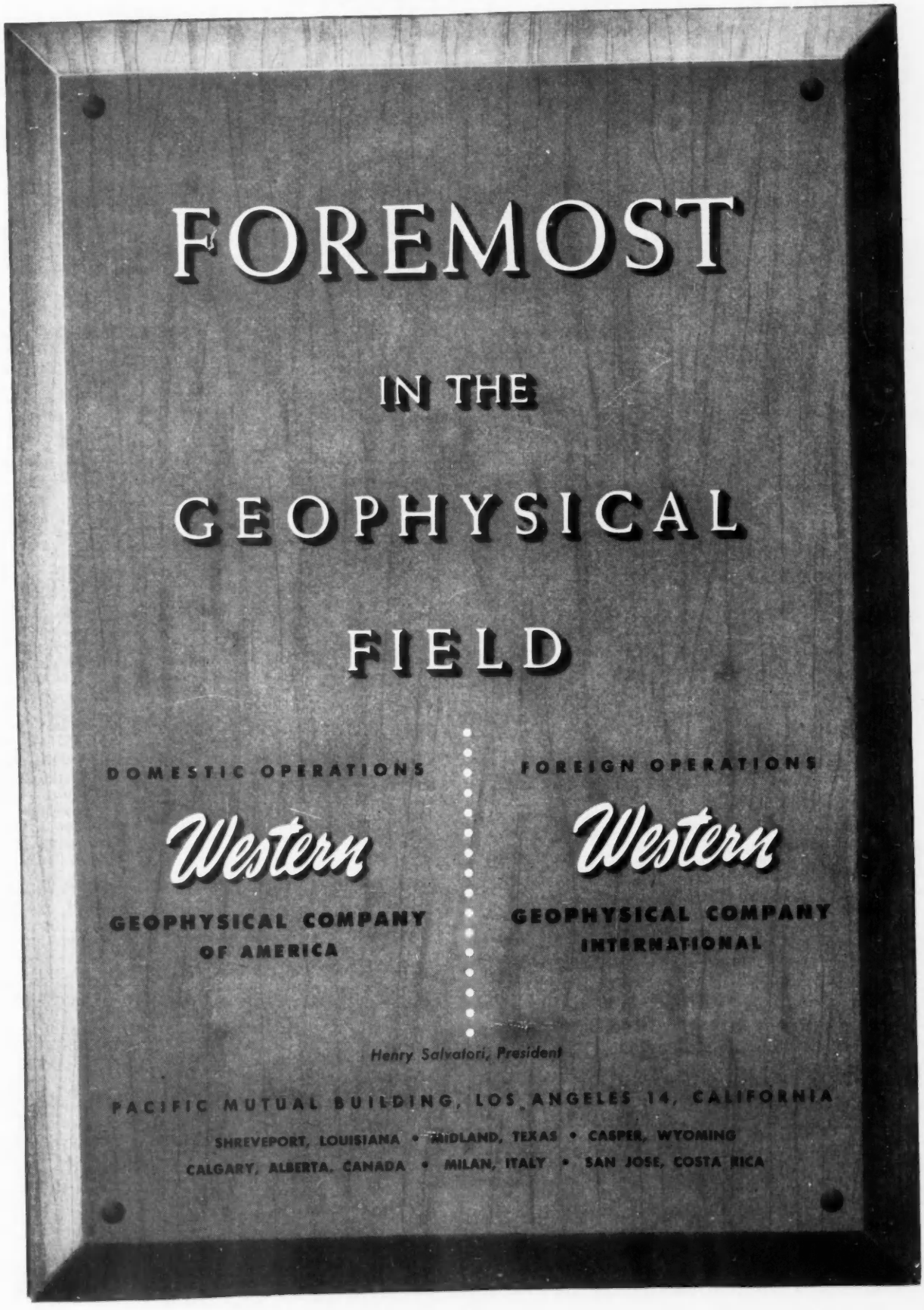
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TEXAS DISTRICT 3—NEW OIL PAYS

Harris County, Fairbanks, South field. Production Maintenance Co.'s Mary Petty Unit 1, Joseph Bays Survey, flowed 132 barrels from Jackson Pettus sand, Eocene 6767-69 feet, ⅛-inch, 34-gravity, completed 9-27-52, TD 7250.

Jefferson County, Clam Lake field. Shell Oil Co.'s McFaddin Trust 1, Mrs. S. A. Pace Survey, Old Well Drilled Deeper, flowed 154 barrels from "X" sand, Miocene 6462-64 feet, ⅛-inch, 36-gravity, completed 10-7-52, TD 6709.

TEXAS DISTRICT 3—OIL FIELD EXTENSIONS

Chambers County, Trinity Bay field. Humble's Galveston Bay State F-18, Galveston Bay Section 15-B, southeast extension, flowed 91 barrels from Frio sand, Oligocene 7648-50 feet, 3/32-inch, 35.4-gravity, completed 10-12-52, TD 8600.

Jefferson County, Beaumont field. H. R. Smith's Wesley Lyons & LeRoy S. Clark 1, Block 27, French Heights Subdivision A, Williams Survey, east extension, pumped 49 barrels from Hett sand, Oligocene 5662-72 feet, 28-gravity, completed 8-13-52, TD 5679.

TEXAS DISTRICT 3—NEW DISTILLATE FIELD

Jefferson County. Adams & Haggerty's Mary E. Fitzhugh et al 1, Lot 3, Stephen Eaton Survey, ungauged from 7100-foot sand, completed 10-5-52, TD 7181.

TEXAS DISTRICT 3—NEW DISTILLATE PAY

San Jacinto County, Lick Branch field. Floyd L. Karsten's Georgia Henderson 1, I&GN RR Survey, flowed 100 barrels distillate and 1.4 million from Henderson sand, Eocene 9233-40 feet, completed 9-2-52, TD 9700.

TEXAS DISTRICT 3—DISTILLATE FIELD EXTENSION

Brazoria County, Pledger field. Humble's Pledger Gas Unit 7-1, James Hensley Survey, 1-mile northeast extension, flowed 98 barrels distillate and 10.7 million from Marginulina sand, Oligocene 6783-6809 feet, open, 55-gravity, completed 9-19-52, TD 6920.

TEXAS DISTRICT 3—NEW GAS FIELD

Colorado County. Johnny Mitchell's Wm. W. Allen 1, E. S. Wooley Survey, ungauged from 1990-2010 feet, completed 10-28-52, TD 9518.

TEXAS DISTRICT 3—NEW GAS PAYS

Montgomery County, Risher field. Austral Oil Exploration Co. Inc.'s Katherine Risher Randall et al 2, Denwood James Survey, flowed 2.1 million from Yegua sand, Eocene 4603-05 feet, open, completed 10-25-52, TD 4810.

Newton County, Camptown field. Houston Oil Company & American Republics Corp.'s Earl C. Hankamer et al B-10, HT&B RR Co. Survey, Section 16, flowed 14.3 million from 1st Hackberry sand, Oligocene 6724-27 feet, open, completed 10-27-52, TD 7400.

TEXAS DISTRICT 4—NEW OIL FIELD

Starr County, El Benadito field. Mayfair Minerals Inc. et al's Mrs. Helen Zanarine et al 1, Tract D, Share 5, Subdivision B, El Benadito Grant, flowed 87 barrels from Zanarine (Frio) sand, Oligocene 5376-92 feet, ⅛-inch, 48.3-gravity, completed 10-1-52, TD 7096.

TEXAS DISTRICT 4—NEW OIL PAYS

Duval County, Crestonia, South field. La Gloria Corp.'s A. L. Wied 1, King & Hillje Subdivision Garrett Ranch, Block 2, flowed 91 barrels from Yegua (Wied) sand, Eocene 4586-89 feet, 46.5-gravity, completed 10-3-52, TD 4730.

Kleberg County, Ritchie field. Ritchie & Mumm Oil Co.'s M. J. Kivlin et al 2, Section 39, Block 8, Kleberg County Improvement & Development Co. Survey, flowed 89 barrels from Frio sand, Oligocene 3269-79 feet, 9/64-inch, 25-gravity, completed 10-27-52, TD 3845.

TEXAS DISTRICT 4—OIL FIELD EXTENSIONS

Duval County, Lundell field. Humble's Paul E. White B-56, R. E. White Survey 138, 4/5-mile southwest extension, flowed 10 barrels from Jackson sand, Eocene 2331-36 feet, ¼-inch, 22.1-gravity, completed 10-4-52, TD 4201.

Nueces County, Luby field. Stanolind's John M. Luby 1, Canutillo Colony Ditch Co., Grant, Mary Luby Petronilla Ranch Subdivision, 2/3-mile northwest extension, flowed 92 barrels from Catahoula sand, Miocene 4335-45 feet, 12/64-inch, 47.1-gravity, completed 10-9-52, TD 5162.

TEXAS DISTRICT 4—NEW DISTILLATE FIELD

Nueces County, Redfish Bay area. Sunray Oil Corp.'s State Tract 423-1, State Tract 423, Corpus Christi Bay, flowed 30 barrels distillate and 4.3 million from Frio 10-B sand, Oligocene, open, completed 9-5-52, TD 7404.

TEXAS DISTRICT 4—NEW GAS FIELDS

Hidalgo County, LaBlanca field. La Gloria Corp.'s La Blanca Gas Unit 2-1, La Blanca Tracts of La Blanca & Llano Grande Grants, Lot 216, flowed 68 barrels distillate and 4.3 million from Vicksburg (La Blanca) sand, Oligocene 10,082-104 feet, 3/16-inch, 59.8-gravity, completed 10-30-52, TD 11,000.

Nueces County, Chapman Ranch field. Republic Natural Gas Co.'s Chapman Ranch 1-112, Section 112, Laureles Farm Tracts, flowed 8.2 million from Miocene sand 3804-14 feet, open, completed 10-20-52, TD 7480.

TEXAS DISTRICT 4—NEW GAS PAY

San Patricio County, Callaboose, West field. Heep Oil Corp. & Herman F. Heep's R. H. Welder 6-1, Section 61, Welder Ranch, flowed 40 million from Frio sand, Oligocene 3682-92 feet, open, completed 10-18-52, TD 3850.

TEXAS DISTRICT 5—NEW OIL FIELD

Hunt County. Floyd C. Ramsey's Paul 1, Mary Latham Survey, pumped 44 barrels oil and 250 barrels water from Woodbine sand, Upper Cretaceous 3310-16 feet, 37.2-gravity, completed 10-6-52, TD 5000.

TEXAS DISTRICT 7-C—NEW OIL FIELDS

Coke County. Marlowe Oil Co.'s Charles Copeland 1, Section 282, Block 1-A, H&TC Survey, flowed 95 barrels oil and 84 barrels water from Ellenburger lime, Ordovician 6420-40 and 6445-49 feet, ¾-inch, 48.5-gravity, completed 10-4-52, TD 6466.

Crockett County. Barron Kidd's Pure-Bean B-1, Section 65, Block OP, GC&SF Survey, pumped 10 barrels from Queen sand, Permian 1136-43 feet, 31-gravity, completed 8-21-52, TD 1143.

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DRILLER
"Compounding the pumps is a quick, easy job since we've been using the WECO Fig. 400 for pump suction connection."
PURCHASING AGENT
"Those tough, durable WECO Fig. 400's give us a lot more service without trouble. And in my language, that's saving money."
DRILLING ENGINEER
"We've standardized on WECO Fig. 400 for pump suction connections, because we never have to match suction hose to pump."
WE GO FOR WECO
FIG. 400 SUCTION UNION

When you use WECO Fig. 400 for your pump suction connection, the female blanking plug at right can replace the female sub on suction line and blank it for compounding the pumps.

● The vibration and pulsation constantly present in a pump suction connection are a real test of sealing ability for any union. The WECO FIG. 400 is a master of this situation, plus the convenience of serving as a blanking plug when compounding pumps.

Rugged acme wing nut threads make-up quickly and a few hammer blows seal the union perfectly. For compounding, blanking plug replaces the female sub. The change-over takes but a few minutes.

The WECO FIG. 400 Suction Union not only provides a fast, simple pump suction connection, but also saves the cost and time of installing blinds or valves in the line for compounding.

Ask your WECO Representative about the Fig. 400 for your pump suction connections.

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Manufacturers and Distributors of Oilfield, Refining, Marine and Industrial Equipment

Upton County, Rankin, South field. Woodward & Company & Dan Auld's Ella M. Corbett 1, Section 11, Block B-2, GC&SF Survey, flowed 337 barrels from Clearfork lime, Permian 6330-60 feet, ¾-inch, 32-gravity, completed 10-7-52, TD 10,897.

TEXAS DISTRICT 7-C—NEW OIL PAY

Crockett County. Barron Kidd's Pure-Bean A-1, Section 81, Block OP, GC&SF Survey, pumped 6 barrels from San Andres lime, Permian 1364-70 feet, 33.6-gravity, completed 9-21-52, TD 1486.

TEXAS DISTRICT 7-C—OIL FIELD EXTENSION

Upton County, Wilshire-Ellenburger field. Wilshire Oil Co.'s McElroy Ranch Co. 32-130, Section 130, Block D, CCSD&-RGNG Survey, ½-mile north extension, flowed 2003 barrels from Ellenburger lime, Ordovician 12,252-419 feet, ¾-inch, 53.8-gravity, completed 10-9-52, TD 12,462.

TEXAS DISTRICT 7-C—NEW DISTILLATE FIELD

Sutton County. W. M. Lyle's G. C. Allison 1, Section 90, Block 9, TW&NG Survey, flowed 20 barrels distillate and 5 million from Strawn sand, Pennsylvanian 5035-50 feet, 61-gravity, completed 10-24-52, TD 6585.

TEXAS DISTRICT 8—NEW OIL FIELDS

Andrews County. Tobe Foster's University Lands 1, Section 17, Block 14, University Lands Survey, Old Well Drilled Deeper, pumped 35 barrels from San Andres lime, Permian 4504-32 feet, 31.2-gravity, completed 10-4-52, TD 4532.

Garza County. Richard S. Anderson's Clyde Miller 1-39, Section 39, Block 6, H&GN Survey, pumped 26 barrels oil and 52 barrels water from San Andres lime, Permian 2429-3074 feet, 37-gravity, completed 10-1-52, TD 3074.

Midland County. Plymouth Oil Company's H. S. Foster A-1, Section 11, Block 41, T2S, T&P Survey, flowed 299 barrels from Strawn lime, Pennsylvanian 10,-570-651 feet, ½-inch, 47-gravity, completed 10-17-52, TD 11,223.

Terry County. Fullerton Oil Co.'s Zorns 1, Section 119, Block T, D&WRR Survey, flowed 522 barrels from Pennsylvanian Reef lime 10,008-029 feet, 10/64-inch, 44.3-gravity, completed 10-24-52, TD 10,032.

TEXAS DISTRICT 8—NEW OIL PAY

Scurry County, Diamond "M" field. Humble's J. E. Sorrels B-4, Section 76, Block 25, H&TC Survey, flowed 360 barrels from Wolfcamp lime, Permian 5310-35 feet, 16/64-inch, 43.3-gravity, completed 10-14-52, TD 6832.

TEXAS DISTRICT 8—OIL FIELD EXTENSIONS

Borden County, Winfield field. Superior Oil Co. & Intex Oil Co.'s R. H. Jordan et al 14, Section 598, Block 97, H&TC Survey, north extension, flowed 185 barrels from Ellenburger lime, Ordovician 8421-32 feet, 8/64-inch, 42.9-gravity, completed 10-28-52, TD 8432.

Pecos County, Fort Stockton field. W. R. Weaver's H. J. Eaton 1, Section 7, Block 146, T&SL Survey, ½-mile west extension, pumped 44 barrels from Yates sand, Permian 2936-62 feet, 33.2-gravity, completed 10-11-52, TD 2962.

Yoakum County, Prentice field. A. W. Cherry's Lee A. Brownfield 1, Section 20, Block K, PSL Survey, 1½-mile northeast extension, pumped 221 barrels from Glorietta lime, Permian 5964-6000 feet, 2-inch, 30.5-gravity, completed 10-7-52, TD 6000.

TEXAS DISTRICT 8—NEW DISTILLATE FIELD

Pecos County. The Texas Co.'s Lillian Rudicil 1, H&GN Survey 541, flowed 3 barrels distillate and 1.1 million from Upper Permian lime 3007-94 feet, ¾-inch, completed 10-19-52, TD 3122.

WYOMING—NEW OIL FIELD

Hot Springs County, Mayfield area. Pacific Western & Ohio Oil Co.'s Gov't E-1, SW SW SE 27-46n-98w, pumped 168 barrels from Curtis sand, Triassic 3843-67 feet, 24-gravity, completed 10-8-52, TD 5054.

WYOMING—NEW GAS FIELD

Natrona County, Castle Creek area. Wind River Oil Co. & Richard King, Jr.'s O'Connor 1, NE SE NE 31-38n-80w, flowed 2.5 million from Wall Creek sand, Upper Cretaceous 2421-37 feet, completed 10-10-52, TD 2523.

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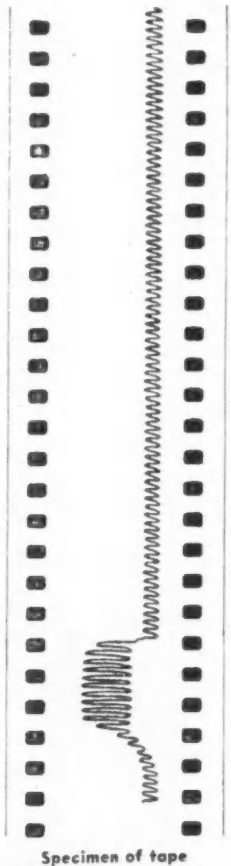


Specimen of tape indicating saturation

RICHARDSON AND BASS, new $1,500,000 drilling barge Blind Pass, a highly flexible and integrated drilling rig, promises outstanding performance in offshore drilling. Capable of drilling to depths beyond 20,000 feet, this modern barge rig has completed its first well at a total depth of 11,159 feet in Aransas Bay off the coast of Rockport, Texas.

Little was left to be desired in equipment and operation of this new giant rig, for the operator spared no expense in assembling the very latest in design and construction of barge rigs. Outstanding in flexibility of operation, Barge 33 incorporates these outstanding features:

- Largest power plant on any drilling rig in the Gulf Coast area.
- Rubber mounted engines to eliminate vibration.
- World's largest traveling and crown block.
- World's largest hook.
- A vacuum type mud degasser which removes entrained gases, retaining desired viscosities.
- Shaft driven rotary table.
- Auxiliary mud pump driven by a stub shaft.
- Mud tanks designed with rounded corners.
- Propeller type mud mixers, electrically driven.
- Impeller type mud agitators.
- Unique cooling system for large engines with temperature control valves and heat exchangers as radiators.
- Code colored piping.
- A unitized lubrication system.

Limited only by the structural limits of the drill pipe, the power plant and the pumps are capable of going beyond any presently anticipated depths.

Lay Out Plans. Practical know-how and engineering technology have been combined in designing one of the world's most flexible rigs. Featuring completeness in every detail the barge has three decks.

- The lower deck houses the mud tanks, the reserve mud tanks, the pump room, the mud laboratory and the keyway.
- The second deck houses the power plant, a 156 foot derrick, the mud storage room and the crew's change room.
- A partial third or upper deck consists of four air-conditioned, sound-proof rooms: (1) A guest room which is equipped with bunk beds and innerspring mattresses; (2) a toolpusher's office with a ship-to-shore radio and a intra-communication telephone system leading to all points on the barge; (3) a kitchen fully equipped with refrigerator and electric cook stove; (4) a toolpusher's quarters including beds and tile showers.

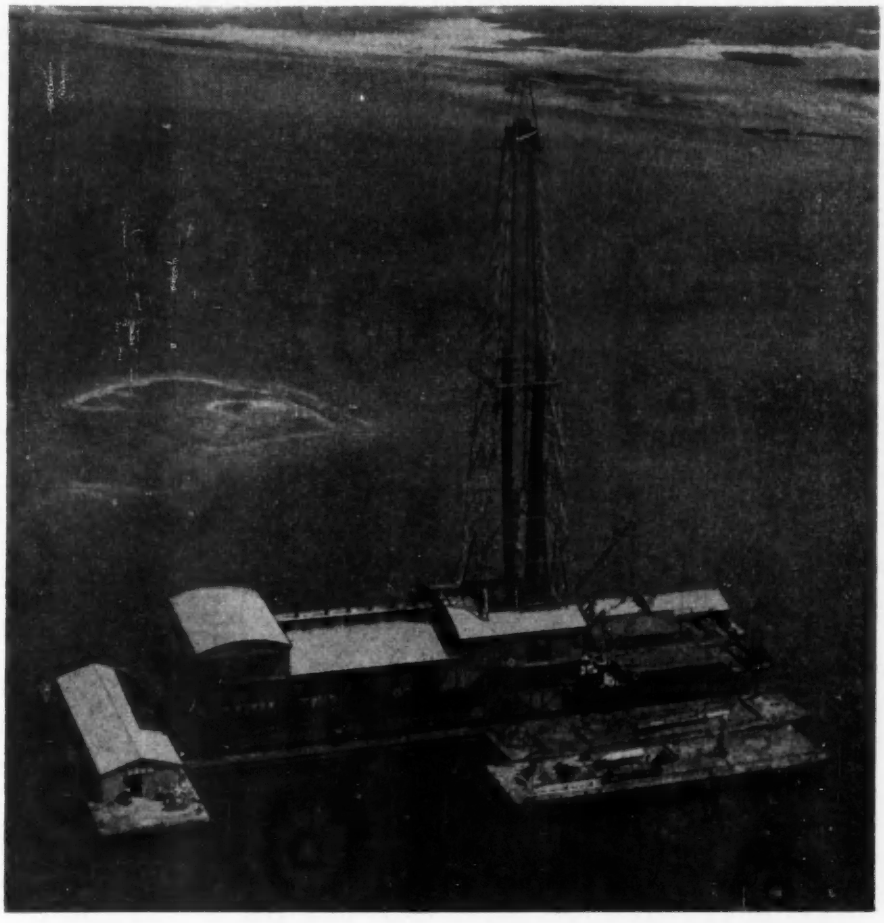


Photo Courtesy Brooner Studios, Corpus Christi

Richardson and Bass' drilling barge Blind Pass as seen from the air with auxiliary barges standing by.

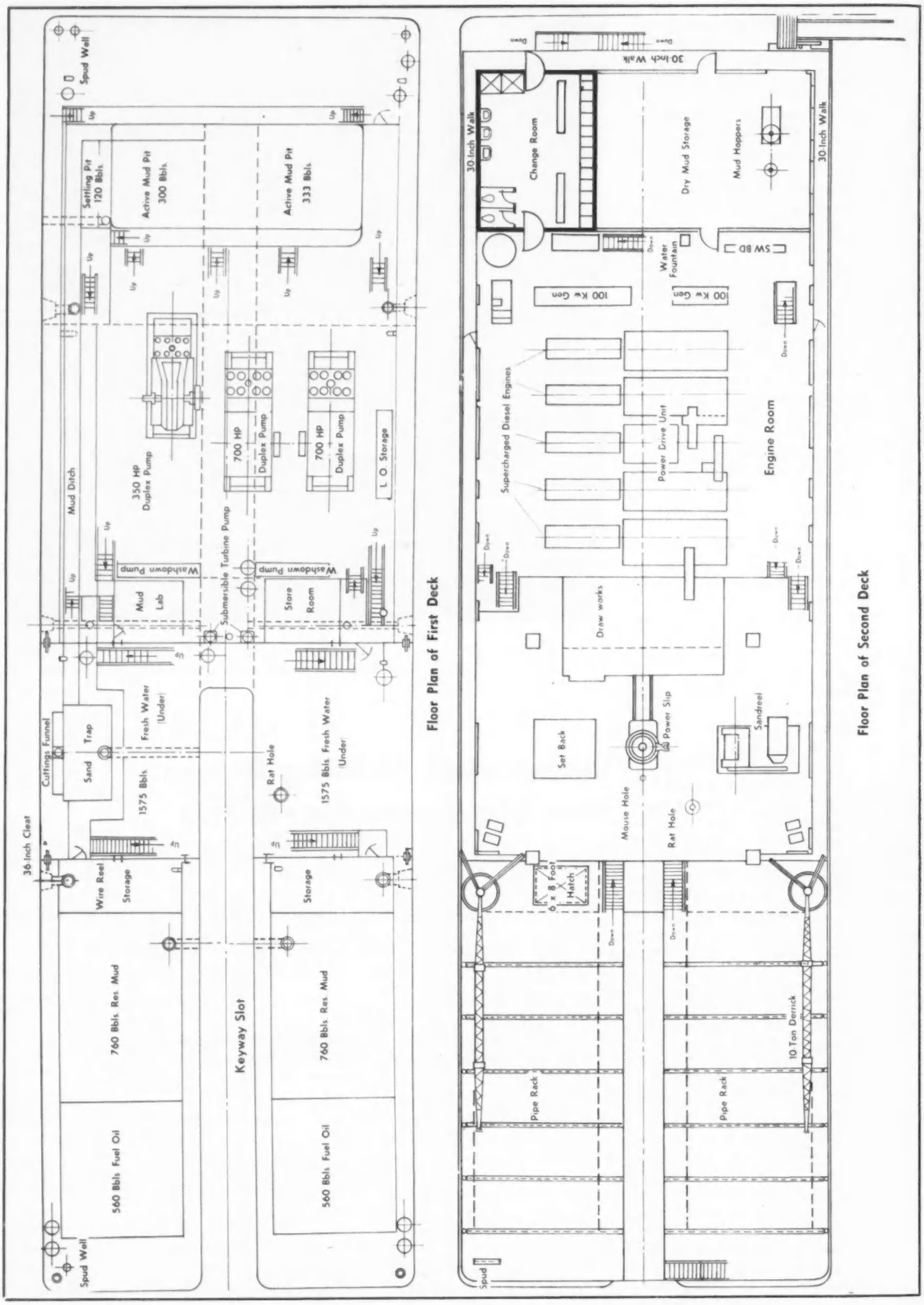
Integrated Drilling Barge Has Maximum Flexibility

This answer to a toolpusher's dream promises outstanding performance in offshore operations.

By CHARLES F. ALBRIGHT, Richardson & Bass, Rockport, Texas
and PHILIP L. McLAUGHLIN, WORLD OIL Staff

The barge is 190 feet long, 54 feet wide and 12 feet deep. Although made of ½-inch steel plates its displacement is only 4½ to 5 feet loaded. The keyway slot is 89 feet and 6 inches long by 8 feet wide. Featuring the ultimate in portability with minimum tear down, the giant barge with all its ponderous equipment may easily be towed to the next location. Requiring only a few hours to rig up, the drilling operations are ready to begin.

Flexibility. Engineered to handle enormous loads with maximum efficiency, this rig is able to drill deep wells quickly. The flexibility rises


Spud Well
Settling Pit 120 Bbls.
Active Mud Pit 300 Bbls.
Active Mud Pit 333 Bbls.
Mud Ditch
350 HP Duplex Pump
700 HP Duplex Pump
700 HP Duplex Pump
L O Storage
Washdown Pump
Washdown Pump
Mud Lab
Submersible Turbine Pump
Store Room
Fresh Water (Under)
Cuttings Funnel
Sand Trap
1575 Bbls.
Rat Hole
1575 Bbls. Fresh Water (Under)
36-Inch Cleat
Wire Reel Storage
Storage
760 Bbls. Res. Mud
760 Bbls. Res. Mud
Keyway Slot
560 Bbls. Fuel Oil
560 Bbls. Fuel Oil
Spud Well
Floor Plan of First Deck
30-Inch Walk
Change Room
Dry Mud Storage
Mud Hoppers
30-Inch Walk
Water Fountain
SW BD
100 Kw Gen
100 Kw Gen
Supercharged Diesel Engines
Power Drive Unit
Engine Room
Draw works
Power Slip
Sandreel
Set Back
Mouse Hole
Rat Hole
6 x 8 Foot Hatch
Pipe Rack
Pipe Rack
10 Ton Derrick
Spud
Floor Plan of Second Deck

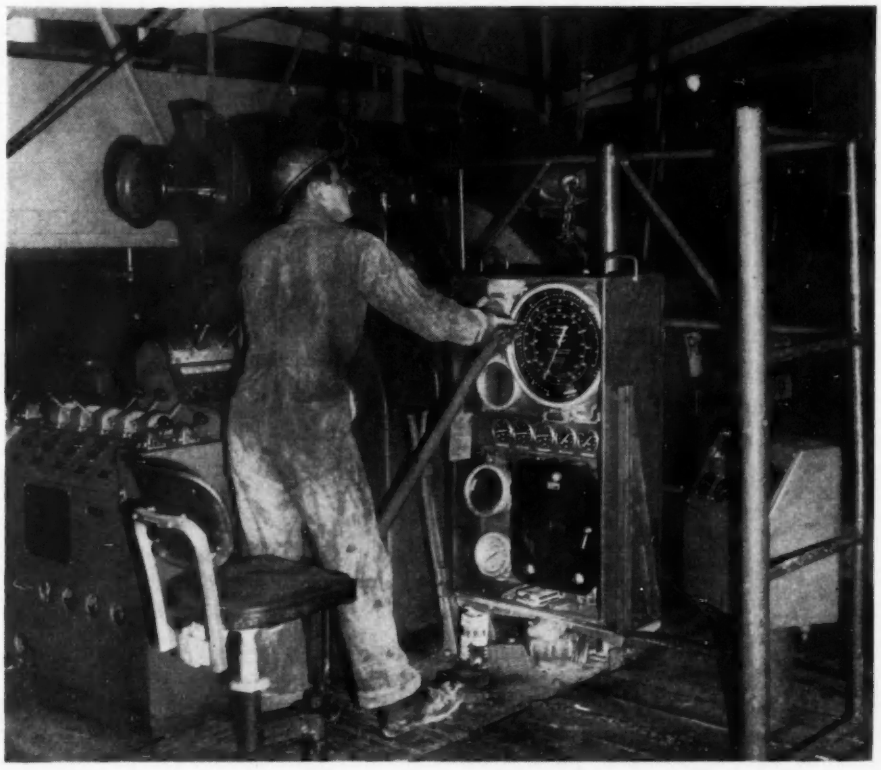
from two major features—the fluid power transmission, which accommodates the full range of engine power and the automatic drilling control.

In drilling the first well many operation advantages resulting from the use of diesel engines equipped with hydraulic couplings were observed. The fluid drive mechanism tended to transform the power into a smooth, steady flow minimizing the wear on the equipment. Harmful vibrations were eliminated since the fluid drive acted as a cushion between the engine and driven equipment. It was possible to control the degree of slip by setting the amount of fluid in the mechanism. This allowed full power application to a stalled slush pump and permitted the engine to operate at its optimum speed while the driver slowed down under load. The fluid drive feature operates as a power cut off for the engine.

A new device permitting accurate filling of the fluid drive unit by remote control from a cabinet at the driller's console makes it possible to vary the flow of power from each engine individually.

The automatic drilling control is one of the most appreciated modern features. The driller may set the precision control on the weight desired and the bit will drill at an optimum rate. It offers a greater rate of penetration—actually making more hole than the driller.

The driller points with pride that after an automatic setting has been made, he is free to make out reports or look for jobs for the crew. If during his absence the rotary is stopped, the feed control automatically discontinues feeding off the drill string.



The control panel was designed to provide positive control over all rig operations. The Power unit, the draw-works, brakes, cathead, drilling controls, pumps, gauges, generator and air conditioner can be controlled from this console.

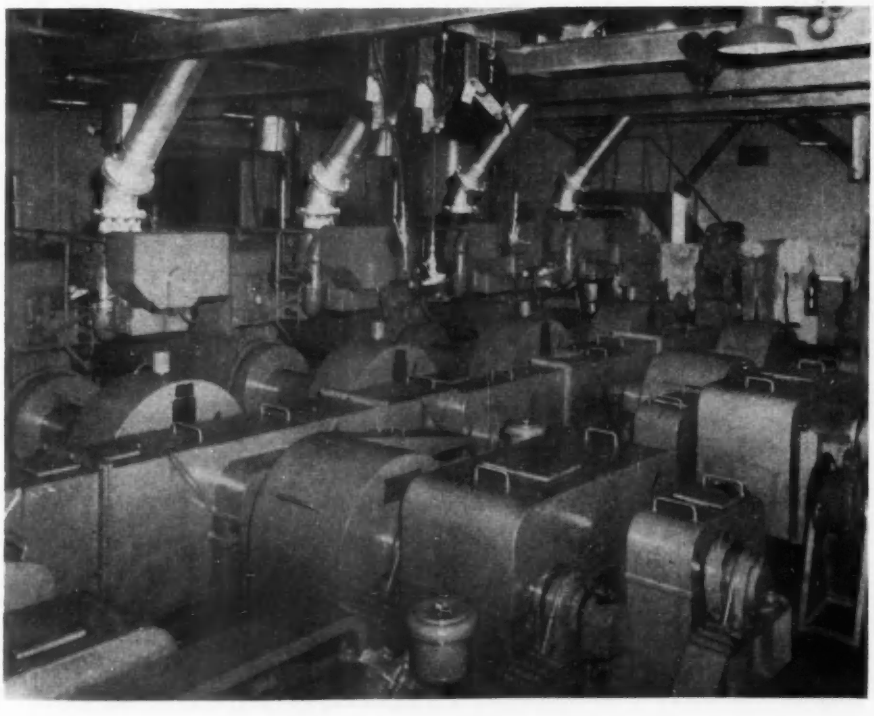
Power Plant. The power plant consists of five 8-cylinder supercharged diesel engines which make available a total of 3350 horsepower, some 1350 horsepower over the manufacturer's specifications for 16,000 to 20,000 foot drilling.

The engines are arranged side by side with proper power distribution to the draw-works, the rotary, the mud pumps, and an auxiliary mud mixing pump.

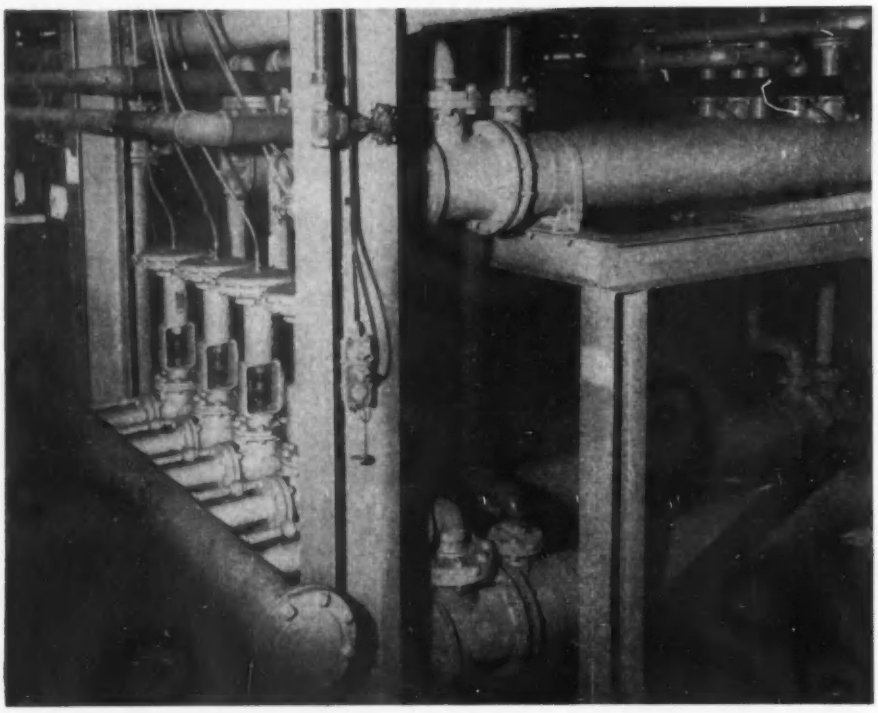
Weighing 22,000 pounds each, these engines could easily set up vibrations which would literally shake a barge to pieces if not mounted on rubber, a new feature of outstanding importance in barge construction. After 42 days of drilling the engines were checked and found to be in perfect alignment.

The full load fuel requirements for the unit runs about 1250 gallons of diesel fuel for 24 hours. However, a dual fuel feed on the engines permits natural gas to be substituted for 40 percent of the diesel fuel. This cuts the diesel fuel requirements to 850 per day while using 175 to 200 Mcf of natural gas. Of course, these quantities vary with the load.

Adequate storage facilities for a 30-day supply of fuel and fresh water have been built into the barge. The storage capacities are 1120 barrels for fuel and 4650 barrels for fresh water. The gas metering system and the scrubber tanks are permanent installations and are standard equipment.



Sectional drive group provides ultimate in flexibility. This overall view of engine room shows drive group in foreground with dual fuel engines in rear.



Heat Exchangers serve as radiators to cool water for engines and hydraulic couplings. Regulators at left operate on engine temperature to control flow of cooling water.

Cooling System. One of the outstanding features is the use of temperature control valves and heat exchangers as radiators for the big power plant.

Two centrifugal, submersible turbine type pumps powered by electric motors are used for circulating salt water through the water jacket of five heat exchangers. These heat exchangers in turn cool and maintain constant temperature on the circulating water for the diesel engines. This contributes to the overall working efficiency of the large diesel power plant.

These pumps also circulate water through the hydraulic couplings, keeping them cool.

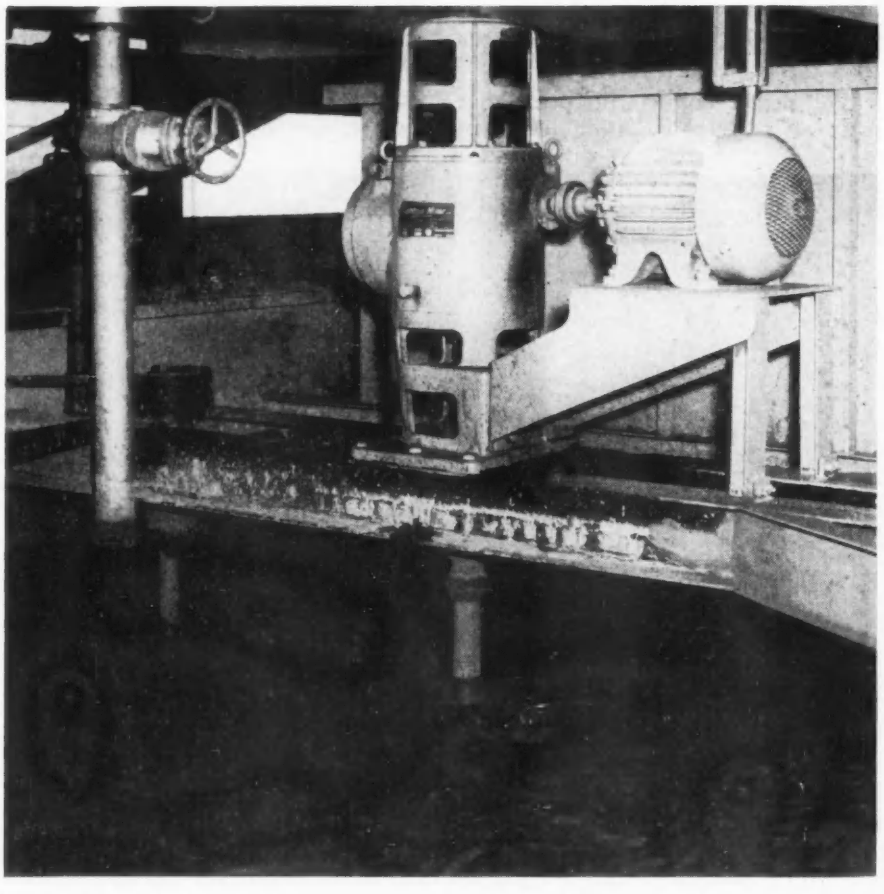
Mud System. The mud system is well designed to offer great flexibility and convenience in handling, storing mixing, pumping and treating of drilling mud throughout the barge.

A pivot-type endless belt conveyor, electrically driven, is used to transfer mud from the barges to a dry mud storage room on the second deck. Here the mud may be stored or may be fed into a hopper to be carried down through a mixing tube by means of a screw conveyor to a propellor which in turn mixes it with the mud in the active mud tanks, one floor below. The bottom propeller offers the advantage of keeping the mud from settling out and provides the desired weight and viscosity. This feature eliminates the use of a mud mixing pump. However, a standby hopper type mixer which is operated off a pump is used in case of electric failure.

Two direct drive impeller-type mud mixers operated by 15 horsepower electric motors are vertically mounted in the center of each of two mud tanks to provide continuous mud agitation. Impellers are placed well below the surface of the mud to prevent entrainment of air that might increase viscosity and reduce weight. By agitating the mud constantly and thoroughly by a submerged impeller, a more nearly homogenous mixture can be maintained. Therefore, when a ten-pound mud is mixed, a ten-pound mud will be taken into the pump suction. In case of electrical failure each pit has two bottom type mud guns as standby equipment.

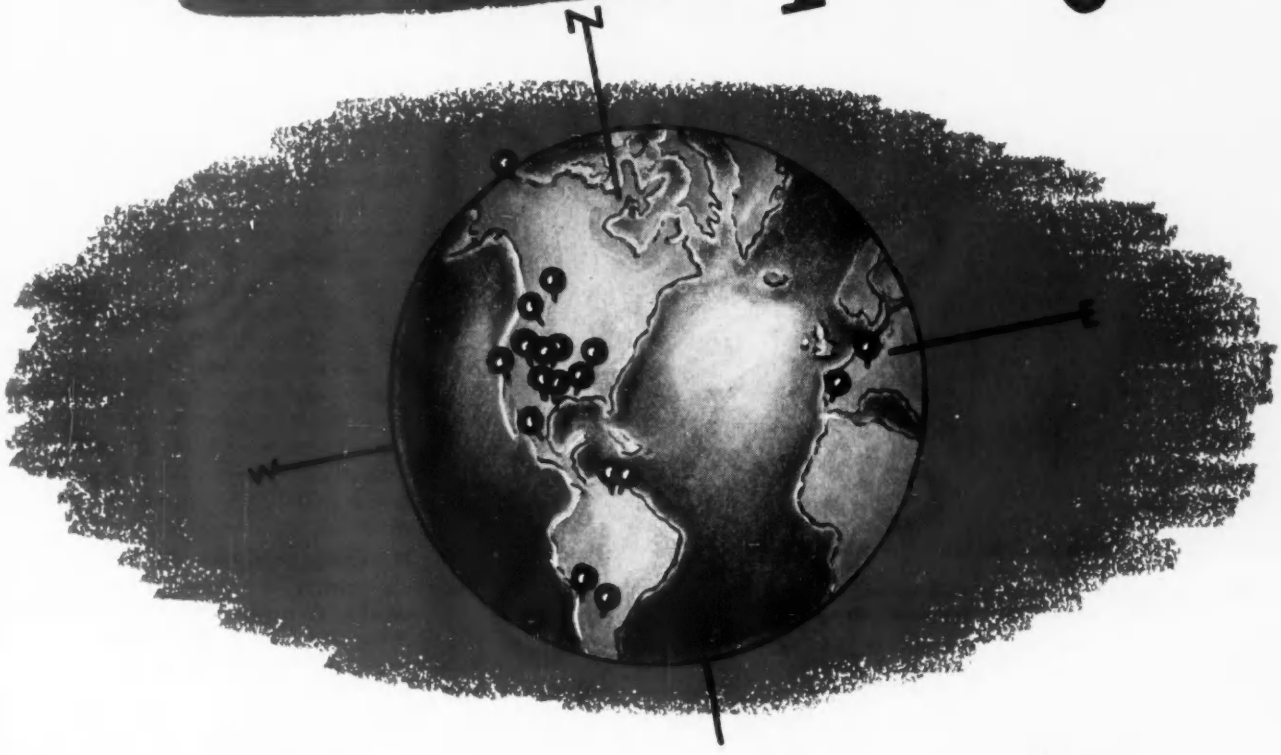
The active mud pits themselves offer outstanding innovations, in that they are nearly squared and have rounded corners to provide a whirling action which prevents settling. Each tank is divided by a baffle plate so that swirling mud breaks against the plate offering better agitation. The total capacity of both active mud tanks is 750 barrels. In addition there is a 120 barrel settling pit and sufficient storage for 1500 barrels of reserve mud.

A slugging tank provides storage for heavy mud that is discharged directly through a separate four-inch line into the mud pump suction prior to making a trip. This makes it possible to obtain dry pipe when coming out of the hole. A completely



Impeller-type mud mixers provide constant agitation, thus offering a more homogenous mixture of drilling mud. Mud tanks designed with round corners, cause a whirling motion to prevent settling.

Wherever you go



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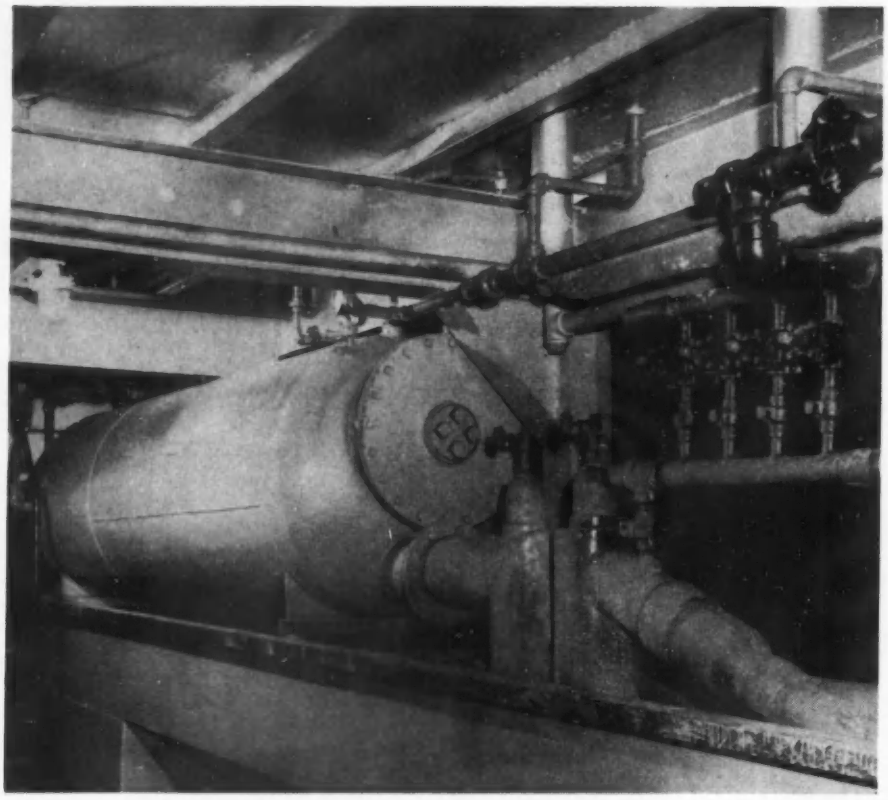


Mud degasser is important feature in mud system. Vacuum pump element draws off gas as mud passes through it to maintain normal viscosities and weights.

equipped mud laboratory runs analysis on returning mud. Chemical treatment as recommended by the laboratory is added by a hand operated chemical feeder.

Returning mud passes through dual shale shakers. These may be used individually or twinned. Two sand traps are provided to catch debris and can be dumped individually or may be bypassed. A funnel sets in front of the shale shaker and offers a convenient method of washing shale overboard or into the keyway in the barge.

New Type Degasser. The mud arrives at the degasser where it may be bypassed or processed. An outstanding first, this company development has application to all users of drilling muds. The degasser takes suction directly out of the mud ditch, where the mud is drawn through the degasser element which is equipped with a vacuum pump, pulling gas off the mud as it goes through. Used at a time of high viscosity the process results in reduced mud viscosity. High abnormal weight mud will be reduced and normal weights will be accomplished.

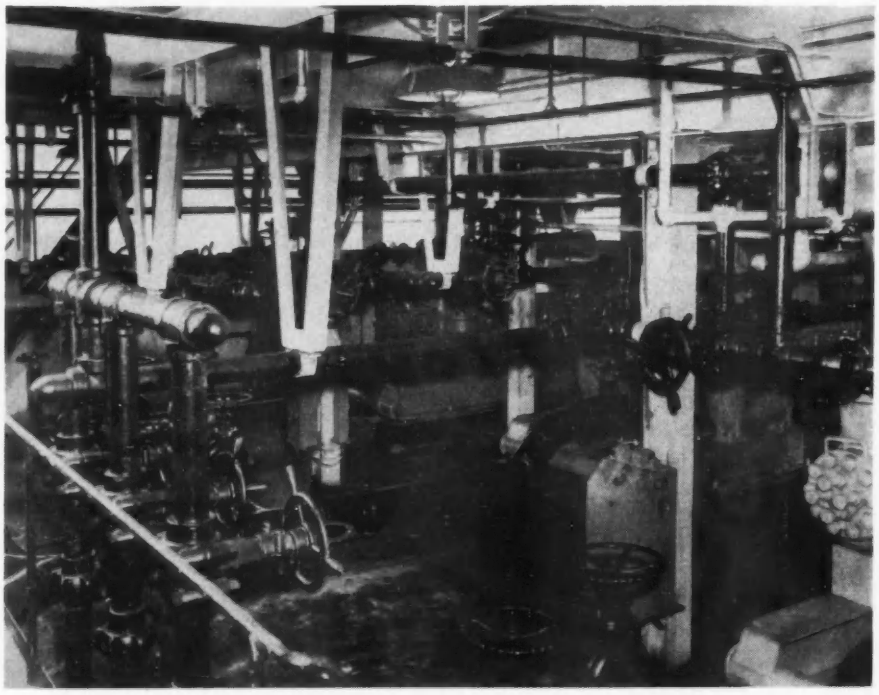
Power Pumps. The use of duplex power slush pumps having 350 hydraulic horsepower rating as standby circulating equipment might surprise many oil men. This pump is commonly used to handle heavier and deeper drilling. On the Richardson barge this pump is used principally for mixing mud. In an attempt to anticipate future mud circulating requirements on modern deep wells of depths in excess of 16,000 to 20,000 feet, two duplex pumps with ratings of 700 horsepower are used for drilling. In drilling, the larger pumps used an 8½-inch liner to a depth of 4000 feet, then a 7¾-inch liner was used to 7000 feet, and a 6¼-inch liner was used to total depth. The 700-horsepower pumps are chain driven with sextuple chains off of compounds on the second deck of the barge. The 350-horsepower pump is driven by means of a stub draft off of the second deck thus eliminating the use of an auxiliary motor.

The flexibility of the pumps might be realized when it is possible to take water with any pump, draw bay water, or take suction directly out of the barge, or take fresh water out of utility barge. A few valves in the right places offer many conveniences because by switching valves each pump has the same function.

Two eccentric-driven duplex power pumps with packed-off liners are used as wash-down pumps. Powered by 15 horsepower electric motors these pumps were selected because they will handle high volumes of fluid for their size and weight.

Hoisting Equipment. A shaft drives the rotary machine from the drawworks. A quieter and more efficient drive over the former chain drive, it has been designed to handle the heaviest loads imposed by deep drilling and to operate at the highest speeds.

The hoisting of 95- to 125-foot stands of drill pipe is an easy job for the big power plant, when using eight lines of 1½-inch wire rope. Using



Pump room incorporates maze of valves and piping that provide maximum flexibility in operation and ease of control. Control box in foreground enables repairman to disengage driller control so that pumps can not be operated inadvertently during repairs.

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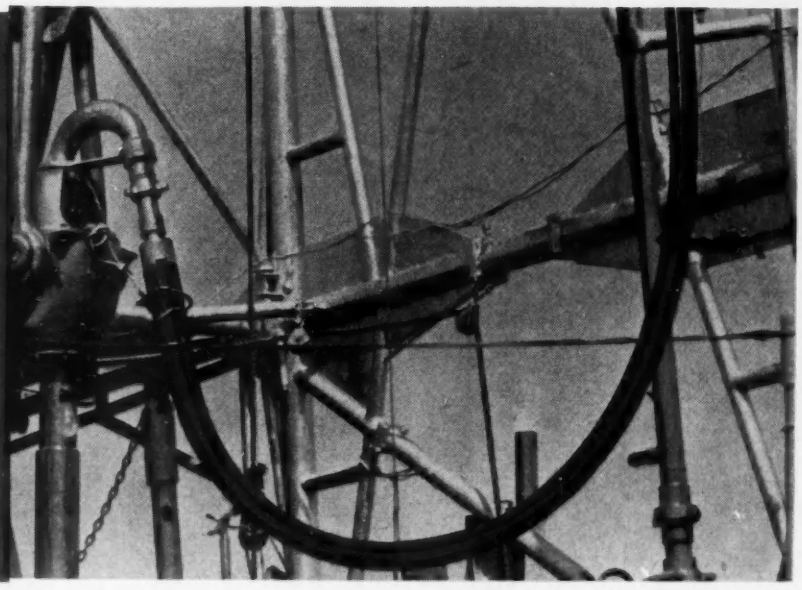

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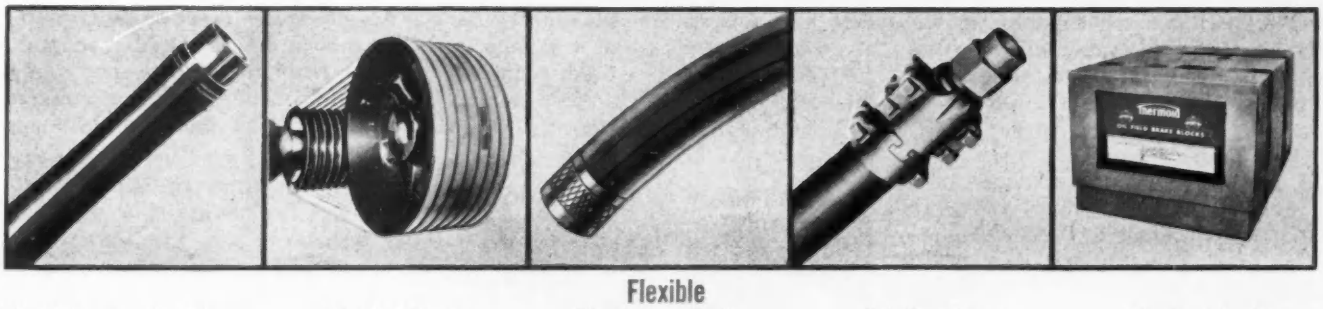

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Resist moisture, and both internal friction and external abrasion. Pre-stretched to insure perfect fit and long life.

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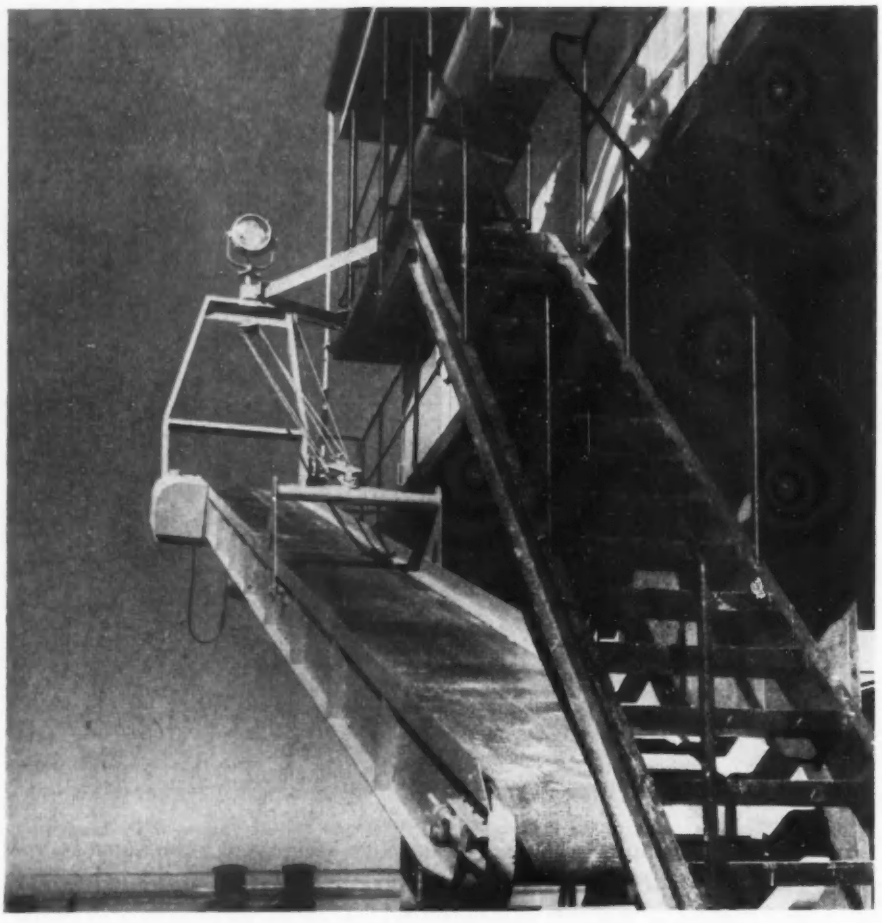


Electrically-driven belt conveyor carries mud from auxiliary barges to mud storage room. It can be hoisted and pivoted at 180-degree angle.

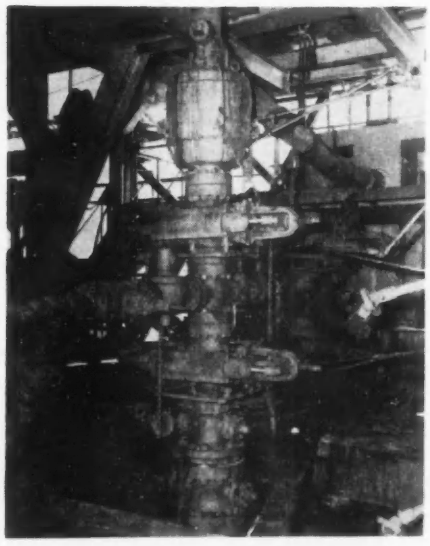
blocks designed for handling the maximum casing loads now contemplated, with reserve capacity in excess of loads allowable on 1½-inch wire line, allows 12 lines to carry a capacity of 540 tons. The largest of its kind, the traveling block weighs 21,840 pounds and falls rapidly in the derrick. Six sheaves of 60-inch diameter on double shafts are used.

The crown block has seven sheaves of 60-inch diameter and has a load capacity of 630 tons. A suspended load of 540 tons may be handled safely.

A new 450-ton capacity hook was recently designed for the deepest drilling, being the extra heavy type. It offers great flexibility in that it takes only 20 minutes to quick change the wash pipe. Packed with a special packing the swivel provides extended use without changing wash pipe or the packing.

The cut-off procedure used on the wire line is an arbitrary one but is based on experience. Below 8500 feet, 25 feet of line is cut off after every fourth trip. At this writing the wire line had made 42 trips, has been cut off three times although no wear was indicated.

The draw-works, designed to meet the performance capacity of 1½-inch wire line, uses a large grooved drum of 36-inch diameter and will handle 1080 feet of line, the length required to hoist 135-foot drill-pipe stands, without spooling more than three full layers of line on the drum. It provides wide range of speeds for hoisting and rotary drives.



Blowout preventer hookup beneath the rotary on first floor.

Such integrated equipment as the automatic drilling control, friction clutch type catheads, which are air controlled, and a 60-inch hydramatic brake are features which may be controlled from the driller's control panel. Even the heaviest loads may be controlled with a minimum effort.

Control Panel. At the driller's control panel, which resembles that of a B-36, the driller has control of every moving object on the rig. Everything on the barge can be shut down from this panel. The controls are made flexible by the following: a selective engine control where two or any number engines may be compounded into the draw-works; engine compounding or selectivity, pump clutch and pump engine fluid drive controls which are located so as to be convenient to operation; manual controls for draw-works, drilling range, and for drilling controls placed on the panel; gauges, including the weight indicator, an instrument for pump pressures, and the automatic drilling controls are conveniently housed in a gauge box to the right of the driller.

Only a few feet away is the blowout preventor valve. This hookup is quite unique in that an accumulator is loaded with 1600 pounds per square inch gauge air pressure that can be used to close the rams "quicker than a minnow can swim a dipper" even though all equipment on the barge is shut down.

An electric water cooler for the convenience of the crew, a loud speaker from the ship-to-shore radio and a telephone booth for communication with all parts on the barge are also located nearby.

Auxiliary Equipment. Many auxiliary items are arranged to facilitate the operations on the barge. The more important attractions are the water tube boiler, the radio system, the AC generators, the permanent cementing piping, the color code used on piping and the telephone system.

A water tube boiler, capable of reaching maximum steam pressure in a few minutes has been installed on the first deck to assist in the cleaning of greases and oils from the machinery.

The electric power is supplied by two 100 KW alternating current generators. Since many auxiliary pieces of equipment are supplied by these generators it becomes important that one generator act as a standby for the other.

The toolpusher's office is supplied with a ship-to-shore radio. Loud speakers are placed at desirable spots

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Toolpusher's office is fully air-conditioned, sound-proofed and equipped with fireproof furniture, filing cabinet, etc. This office contains ship-to-shore radio, intra-barge communications and drafting table.

on the barge so that orders from shore may be passed on to the crew members.

Permanent piping which will facilitate cementing and testing have been installed on either side of the barge eliminating the stringing of pipe over the barge from a service unit. Tie-in connections for water and mud are available from three-inch lines.

All piping has been color coded in an effort to aid repairmen in tracing lines, and in helping new men become acquainted with the lines. The code currently used is as follows: Mud lines—black, fresh water lines—blue, salt lines—yellow, fuel lines—red, and air lines—green.

The intra-communication telephone system offers many advantages in that eight phones in semi-soundproof booths are provided at key points on the barge—in the office, on the derrick floor, in the mud laboratory, on the pipe rack, in the pump room, in the derrick, in the dry mud storage room and in the engine room. An alarm sounds and a red light flashes, thus giving double assurance that a man's attention will be attracted above the din of the engine noise.

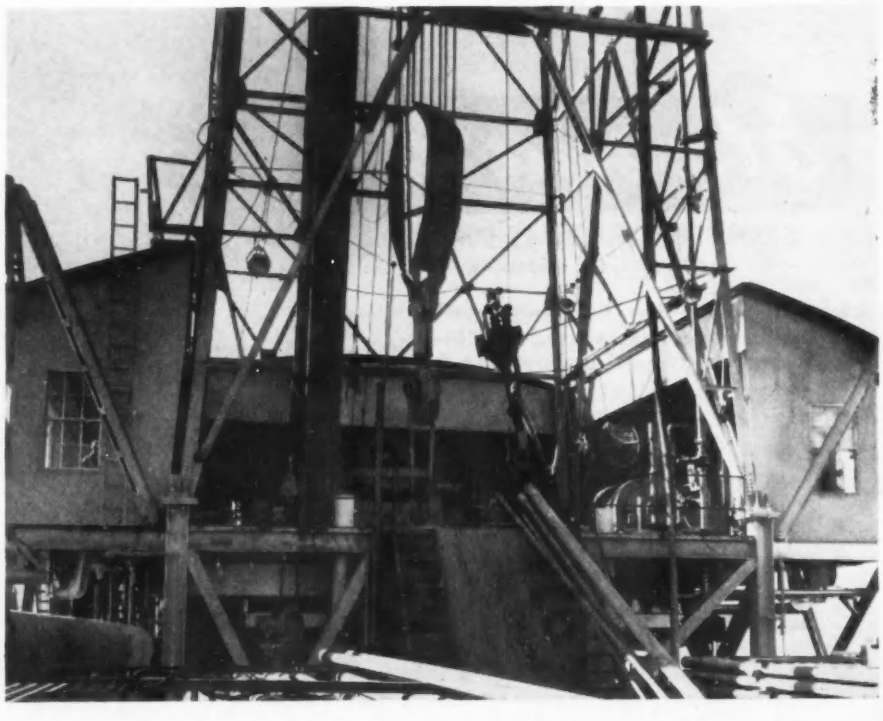
A complete central lubrication system has been installed to facilitate oiling and greasing of the rig. No more filling of oil and grease by guns. All lubrication is automatically completed by compressed air guns operated from the control panel, saving bearings and motors.

Conclusion. The features mentioned above will undoubtedly cut the time required to drill deep holes in offshore operations. Through greater penetration rates, less maintenance, coupled with ease of operation, the overall drilling costs can be reduced.

Offering the ultimate in portability and flexibility this rig promises a look into the future. Modernization in drilling will eventually cut the cost per well.

About the Author

CHARLES F. ALBRIGHT has been associated with the drilling industry for the past 20 years, having worked as a roughneck, driller and toolpusher—the position he now holds for Richardson & Bass. He saw the realization of a lifetime ambition when he helped to rig up "Blind Pass" with completely new equipment. An important member of a team, including engineers and employes of various equipment manufacturers, contributing to the success of the barge, he was best qualified to become the toolpusher of this floating island of machinery.



Derrick floor as seen from V, showing massive traveling block, hook and swivel.

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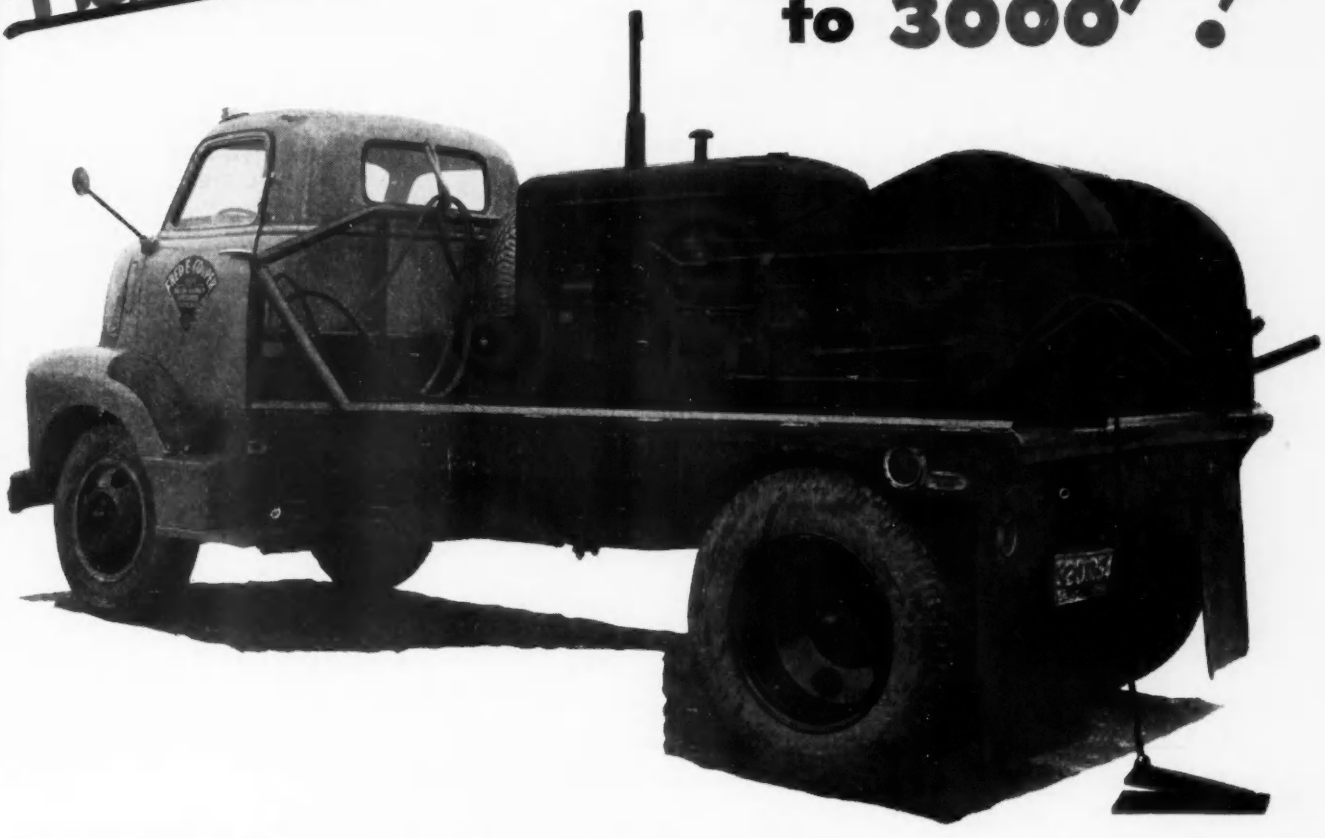

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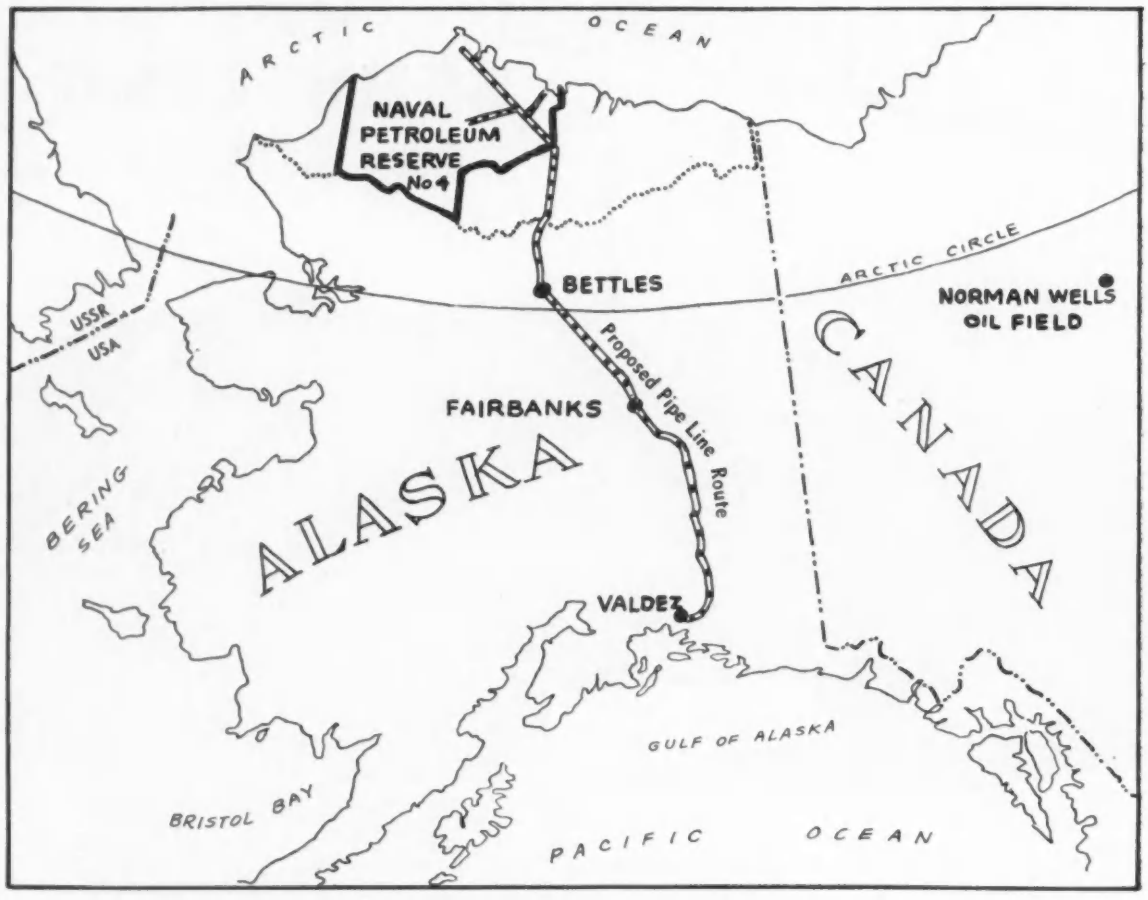


Naval Petroleum Reserve 4—at Alaska's northernmost tip.

How Wells Are Drilled in Permafrost

The Arctic region presents many operational problems. And rigging for location often is more complicated than actual drilling process.

By COMDR. RALPH C. JENSEN
Assistant Director, Naval Petroleum Reserve

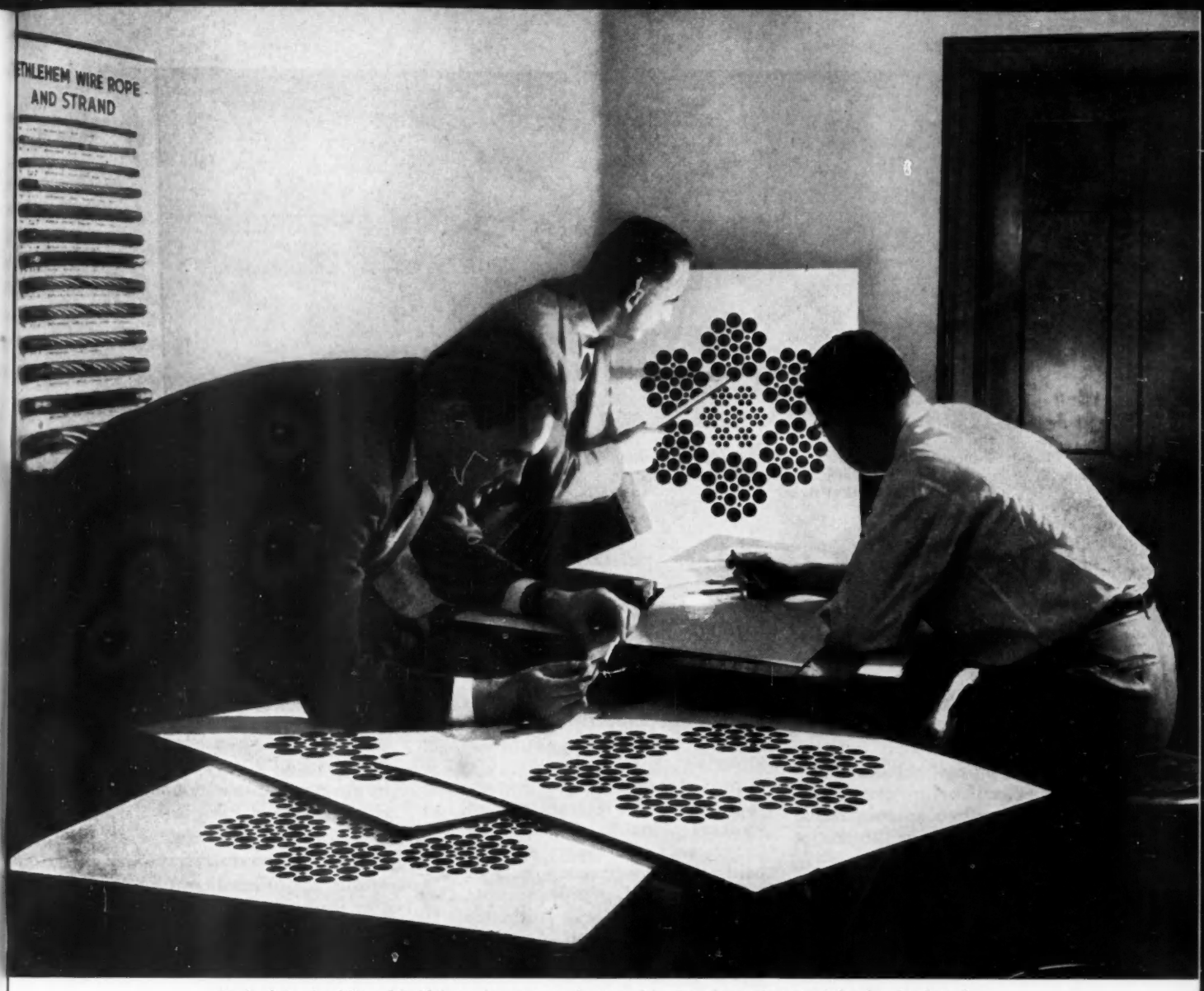
SOME INTERESTING and unique problems have resulted in the exploration program of Naval Petroleum Reserve 4 from the existence of permafrost. Some of these problems are discussed here.

For several years the U. S. Navy has been engaged in an extensive search for oil in Naval Petroleum Reserve 4. This is a vast, desolate, 37,000-square-mile area on the northern Arctic Slope of Alaska. There temperatures range from plus 50 degrees in the summer to minus 50 degrees in winter.

In a recent issue of WORLD OIL, Capt. R. H. Meade, director, Naval Petroleum Reserves, described some difficulties encountered in this undertaking. While the term permafrost is relatively new, the existence of deeply frozen ground has been known for centuries. Frobisher is reported to have encountered such phenomenon after his voyage to the New World in the sixteenth century. Geology texts have for years described ice-age mammals that have been found in remarkable states of preservation in frozen ground in Siberia. In 1943, S. W. Muller, an authority on the subject, proposed the name "permafrost" for "a thickness of soil or other superficial deposit, or even bedrock at a variable depth beneath the surface of the earth, in which a temperature below freezing has existed for a long time." This term and its definition has been generally accepted for both scientific and common usage.

L. L. Ray has divided permafrost into three types on a regional basis:

1. **Continuous**—where it is of wide



Much of the durability of Bethlehem wire rope can be traced back to the engineer and the drawing-board.

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These engineers are engaged in a typical discussion of the product they live with—Bethlehem wire rope. They know the tremendous importance of good design, good engineering . . . and they will spend many hours, sometimes days, over a seemingly small point that they feel will improve the quality of Bethlehem rope.

The making of wire rope is more than a matter of drawing wire and laying wires and strands into intricate patterns. Wire rope starts in the minds of engineers, and at Bethlehem these minds are busy ones.

When you rig with Bethlehem rope, you can be sure that the rope has been well designed, well engineered . . . and that every subsequent step has received the same degree of care.

This care pays off on the job, where Bethlehem rope will serve you well. You can depend upon every foot, every inch of it, no matter how tough the going.

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When you think WIRE ROPE . . . think BETHLEHEM

"Puddling in" of 12-inch-by-12-inch refrigerated sills for cementing pump foundation. Pipe racks at left. Derrick substructure supported on refrigerated mats at right.

Here's a typical view of the Arctic coastal plain from the Arctic Ocean showing tundra, lakes and many ponds.

and uninterrupted regional extent.

2. **Discontinuous**—where there are scattered islands of unfrozen material termed talik, after the Russians.
3. **Sporadic**—where small islands of permafrost occur in regions of thawed ground.

The greater part of Alaska is underlain by permafrost in one or another of these three forms. Naval Petroleum Reserve 4 is in the belt of continuous permafrost.

Locally, permafrost may be divided into two distinct zones. The *surface layer* or the *active zone* may be wholly frozen or wholly thawed, dependent upon the season of the year. In the *lower layer* or the *stable zone*, the permafrost is relatively stable unless disturbed by artificial means. Within NPR 4 the active zone is generally less than 24 inches deep. The stable zone, or zone of no thaw, varies in thickness from approximately 600 feet on the northern shore of the Arctic to 1100 feet some 200 miles southward in the foothills belt of the Brooks range which comprises the southern boundary of the reserve.

Temperature Range

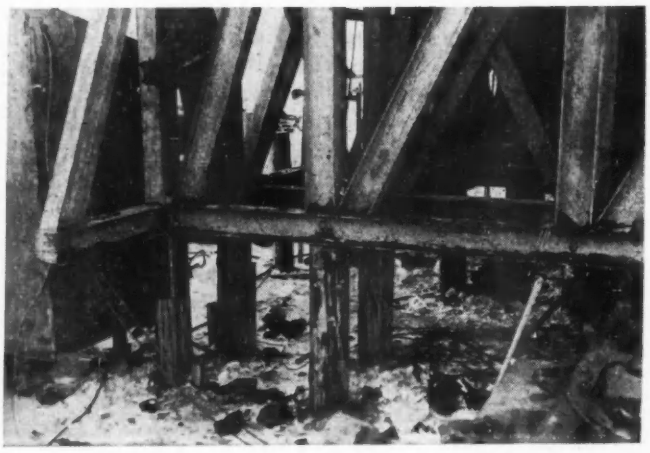
Constant temperatures of the permafrost range from 32° F. at the lower depth to as low as 14° F. at approximately 100 feet from the surface. Above 100 feet, the temperature varies seasonably in a considerable range, with the active surface zone being the only part which thaws annually. It is of interest to note that the thermal gradient with depth is similar to that found in wells in the temperate zone; it just starts 50° to 60° F. lower on the scale.

The tundra, which comprises the surface covering of the active zone of the permafrost, forms a striking pattern of polygons varying in size. These polygons are quite pronounced in the summer but hardly discernible in the winter when the surface is coated with a deep blanket of snow. Many of these polygons enclose ponds and lakes which provide landing areas for small planes equipped with floats in the summer and skis in the winter.

Within the permafrost, there is, of course, considerable moisture. Sometimes the material may be only frozen muck extending a variable distance down from the surface. At other times, more competent formations in a frozen state approach the surface and sometime outcrop. The frozen particles of moisture contained in the subsurface formations may vary in size from minute ice grains existing in the voids of the sediments to massive lenses or dikes of pure ice. It is this condition that has posed some interesting and unique problems in drilling, particularly the deeper wells.

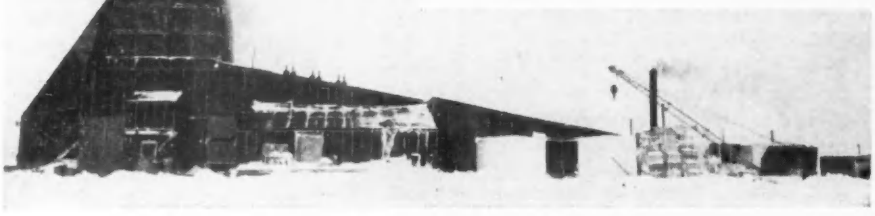
Where the top of a competent bed approaches the surface, piling can be set into the formation. If set in the winter, steam points or jets are generally used to thaw the ground suf-

This is a naturally-refrigerated meat cellar in permafrost below ground at Point Barrow, Alaska.



Substructure of rig supported on pilings set by steam jets through permafrost.

A typical wanigan used at outlying drilling site. This is geologist's and petroleum engineer's wanigan.



This view shows method of enclosing drilling rig for year-round operation.

ficiently to set the piling. Once set, water in the formation rapidly refreezes to hold the piling in place. If set during the period of surface thaw, which extends from late spring to early fall, holes must be drilled for the piling. This condition holds true for the comparatively shallow wells of 4000 to 5000 feet in depth. For deeper wells which require periods of drilling, sufficient time elapses to permit heat from the circulating drilling muds to be transferred to the areas of the rig foundation, thus endangering the piling supports even though they have been set 20 or more feet into the subsurface. In some deep holes, this problem has been solved by using metal piling and circulating refrigerant therein.

Piling Impractical

On some of the deeper holes and particularly where competent formations are not encountered above a depth of 50 or more feet, it has been found impractical to attempt to set piling. This has been found particularly true in cases where the formations above are thawed from the heat transmitted from circulating drilling muds, thus rendering piling laterally unstable as a supporting medium. In such cases, a simple mat of timbers with refrigerating coils attached to the under side has been found to be quite effective.

The mats are placed on top of the ground under the structure to be supported and a refrigerant circulated through the coils. The refrigerant keeps the foundation frozen in place in summer. Manifestly, because of the extremely low atmospheric temperatures encountered in the winter, no refrigeration is necessary during that period. The use of refrigerated mats also assists the removal of the rig and substructure when drilling is completed. This is done by simply reversing the refrigerating process and passing steam through the coils to thaw the ground under the mats, thus freeing them for easy removal.

Another series of problems which caused trouble at first but which have since been overcome, although not completely, have been in connection with cementing operations. These problems so intrigued Maj. Foster L. White, a young Air Force officer who was assigned to work at PET 4 (as the Alaskan project is sometimes called), that he did considerable research on the subject. His work formed the foundation of a thesis on the subject of "Cement in Permafrost in Naval Petroleum Reserve No. 4." This thesis was recently submitted to the University of Oklahoma in fulfillment of the requirements for the professional degree of petroleum engineer.

It was early found that the neat cement slurries would not always set in the 14° to 32° F. temperatures encountered in the permafrost. It was also found that the dry cement first had to be covered and heat applied for a period ranging from 24 to 48 hours in order to bring the cement to a temperature of plus or minus 20° F. Mixing water at a temperature of 100° to 120° F. was required to maintain the temperature of the slurry at about 70° when pumped into the well. Adding approximately four per cent calcium chloride to the mixing water under these conditions has given good results.

Fairly Good Results

White's experiments, and other experiments performed by contractors in charge of the exploration work, utilized this procedure with varying amounts of calcium chloride, with sodium chloride and with gypsum cement in place of cement. Fairly good results were obtained in temperatures near freezing. It was found, however, that at subzero temperatures gypsum cement gave the best results. While gypsum cement does not have the strength of some cement, it has been found in the Arctic to be strong enough for cementing the conductor pipe and it has the additional desirable characteristic of being able to take an initial set before the cement freezes in the below freezing temperature.

It is the current cementing practice in NPR 4 to set the conductor pipe some 30 feet into the first competent bed encountered. While the lower 30 feet is little affected by the heat of

the cement, ice in the upper portion of the hole will thaw away from the cement while it is being placed. If the hole is left undisturbed for a day or so, the ice will freeze back to the cement but will rethaw when the mud is circulated during drilling. To overcome this, the top 60 feet of the conductor pipe is jacketed with a larger pipe to provide a dead air space of 2 or 3 inches. It has been found that this added insulation prevents circulation breaking around the conductor pipe after surface casing has been set below.

In a few cases while drilling at comparatively shallow depth, a constricting formation of ice has been encountered in the casing. Considerable thought has been given to the probable cause of this phenomenon. For awhile it was thought that the constriction might be due to shearing of the casing at the point of constriction, induced by earth movement. While this cause has not been completely ruled out, a more likely explanation is that of casing collapse caused by pressure on the casing induced by the freezing of drilling mud in the annular space between the casing and the formation.

100 Feet Coldest

With the coldest point in the permafrost being at a depth of about 100 feet, ice will first form in that region, gradually freezing downward. Its expansion sets up a tremendous pressure which is transmitted downward by the mud column remaining in the annulus after cement has been set around the shoe of the surface casing. However, with the lower end of the casing sealed off and with the water particles frozen in the voids of the formation, there is no place for the pressure to be released. Pressures under such condition sometime exceed the collapsing strength of the pipe and it will then give away. Even though the casing may be collapsed under such conditions, little danger exists so long as the ice remains. However, in subsequent drilling operations, or if petroleum is obtained at depth, the heat from the upward moving fluid will eventually thaw the ice and damage to the well as well as to the field may easily result.

Until more is known about this problem of casing collapse in NPR 4, a procedure is now being followed that has so far prevented further collapse. This procedure is as follows: The conductor pipe is set at about 100 feet and the annulus is completely cemented from shoe to surface. On all deeper strings of casing, heavy crude oil (20° API) from wells already brought in on the reserve is first pumped in. This is followed by 50 to 60 barrels of brine immediately ahead of the cement. This operation forces the crude oil into the coldest section of the annulus to prevent refreezing of the water particles, while the brine cleans the wall ahead of the cement.

Some holes treated in the manner just mentioned and which have proved to be dry holes have been plugged with cement at the shoe of the surface casing (just below the permafrost) and the mud bailed down to a thousand feet before abandonment. It is proposed, when sufficient time has elapsed, to inspect the casing to check the effectiveness of this procedure.

Drilling in the subzero Arctic has developed other problems, too. While these problems have not all been due to the permafrost, they have been due to the intensely cold atmosphere prevailing on the Arctic Slope in winter. They might, therefore, be considered related to those already discussed. These problems will be touched upon but briefly.

One such problem solved early in the program was how to permit drilling throughout the year. The solution to this problem was easy, and consisted of completely enclosing the derrick with a double layer of canvas and heating the interior with steam provided by a small boiler which was also used to heat the drilling mud. Drilling crews in remote locations are housed adjacent to the rig in heated quonset huts or in shacks called wanigans specially constructed and insulated. These wanigans are mounted on sleds for portability over the frozen surfaces in winter.

Clothing Tested

New lightweight Arctic clothing developed by the Armed Forces has been tested on this program and found to be quite effective. Lubricants developed to withstand the great temperature ranges in the Arctic have also been tested, as has other specialized equipment.

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The know-how gained by the people engaged in this work over the past several years should prove to be a valuable asset, not only to the oil industry for future work under similar conditions, but to our Armed Forces as well.

About the Author

COMDR. RALPH C. JENSEN was graduated from Colorado School of Mines in 1932 and pursued graduate work in geology at University of Hawaii and Colorado School of Mines. Following graduation from the School of Mines, he was employed as a field engineer, Dredging Division, Panama Canal. He entered the U. S. Navy in 1941 as a reserve officer in the Civil Engineering corps. At the close of World War II he transferred to the regular Navy. Wartime posts included Officer in Charge of Construction, Naval Operating Base, Bermuda, and Resident Officer in charge of Construction, Naval Ammunition Depot, Port Chicago, Calif. He reported for duty with Director, Naval Petroleum Reserves, in June 1951 following a two-year tour of duty on staff of Commander, Service Force, Pacific Fleet, with headquarters in Pearl Harbor. In his present capacity as Assistant Director, Naval Petroleum Reserves, he is responsible under the Director for administration of the Navy's exploration program in Naval Petroleum Reserve 4. Comdr. Jensen was born in Holmestrand, Norway.

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The opinions or assertions contained in this article are the private ones of the writer and are not to be construed as official or reflecting the views of the Navy Department or the Naval Establishment at large.

BIBLIOGRAPHY

Permafrost or Permanently Frozen Ground and Related Engineering Problems, by S. W. Muller. Strategic Engineering Study 62, U. S. Army Engineers, 1945.

Permafrost, by Louis L. Ray. *Journal of the Arctic Institute of North America*, Vol. 4, No. 3, Dec. 1951.

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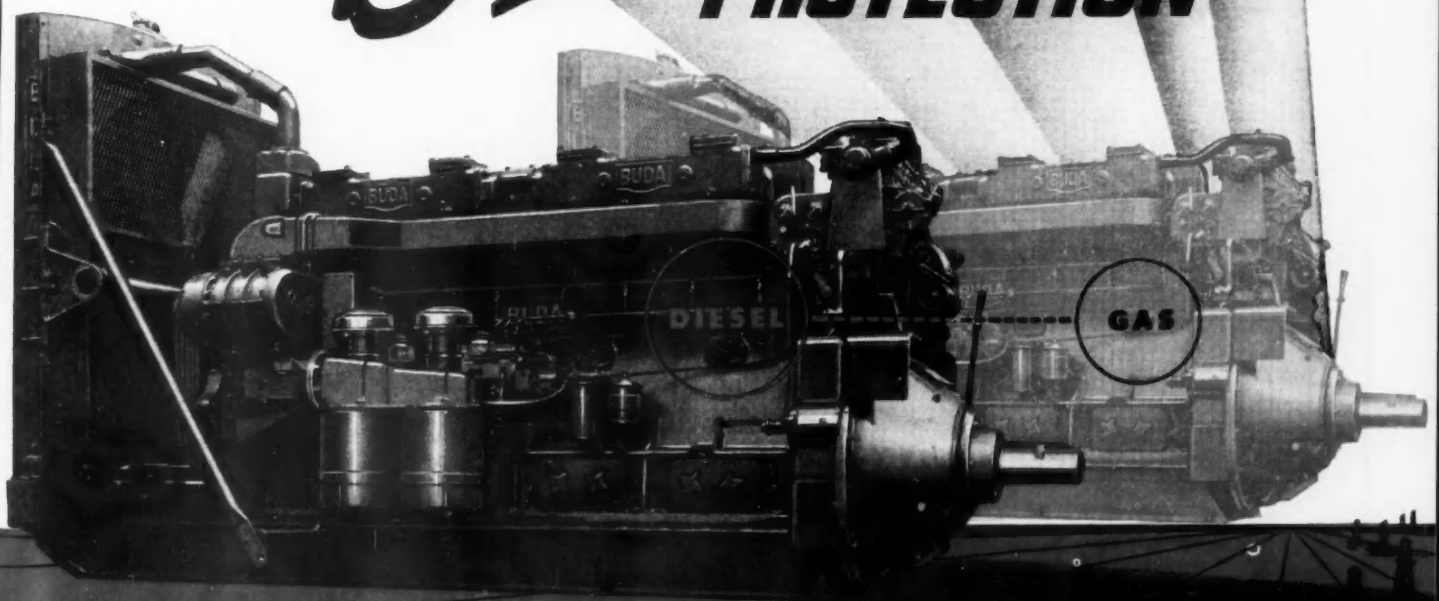

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How To Increase Drilling Line Service

Basic principles must be adhered to for maximum wear; moving and cutting should be based on actual work done.

By J. N. KEMPLE
Columbia-Geneva Steel Division, U. S. Steel Company

PRESENT ROTARY drilling line practice varies widely from using the shortest possible length drilling line with the dead end fastened to the becket of the traveling block, to the use of lines over 5000 feet in length with elaborate moving and cutting programs. Despite this wide divergence, all operators have essentially the same objectives of safety and economy in drilling line use. The variations, although, partially attributable to individual preferences, must be due principally to differences in drilling equipment and conditions. Thus, it immediately seems evident that no single standardized program can possibly provide maximum economy for all operators under all conditions. It is equally evident that there must be certain basic principles which determine maximum economy on any type of drilling equipment and under all conditions.

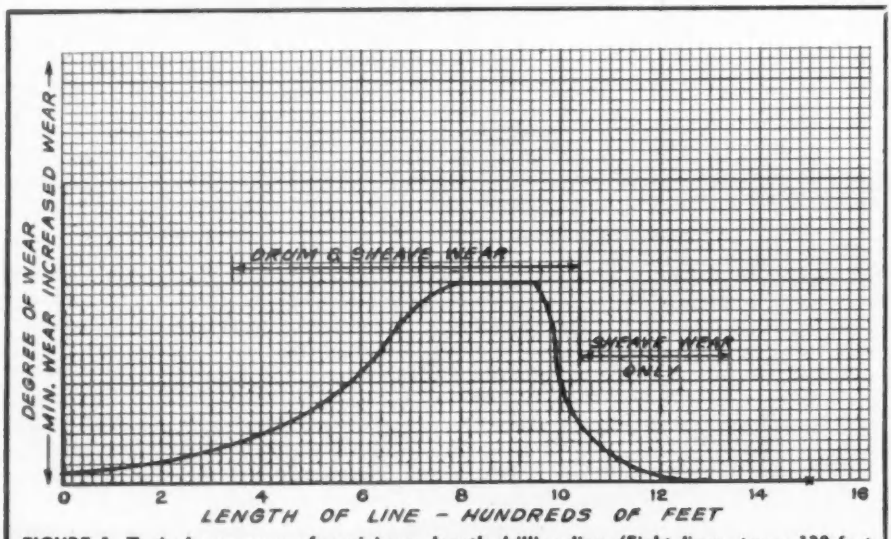


FIGURE 1. Typical wear curve for minimum length drilling line. (Eight lines strung 138-foot derrick; 200 feet assumed required to fill base layer of drum.)

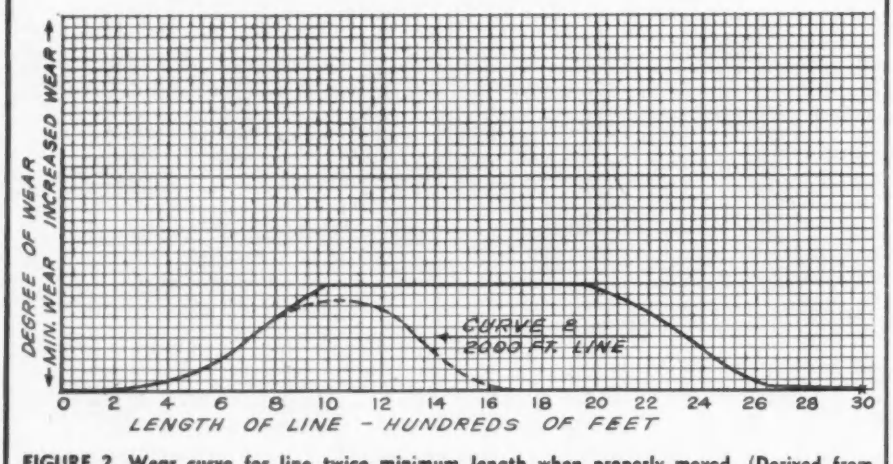
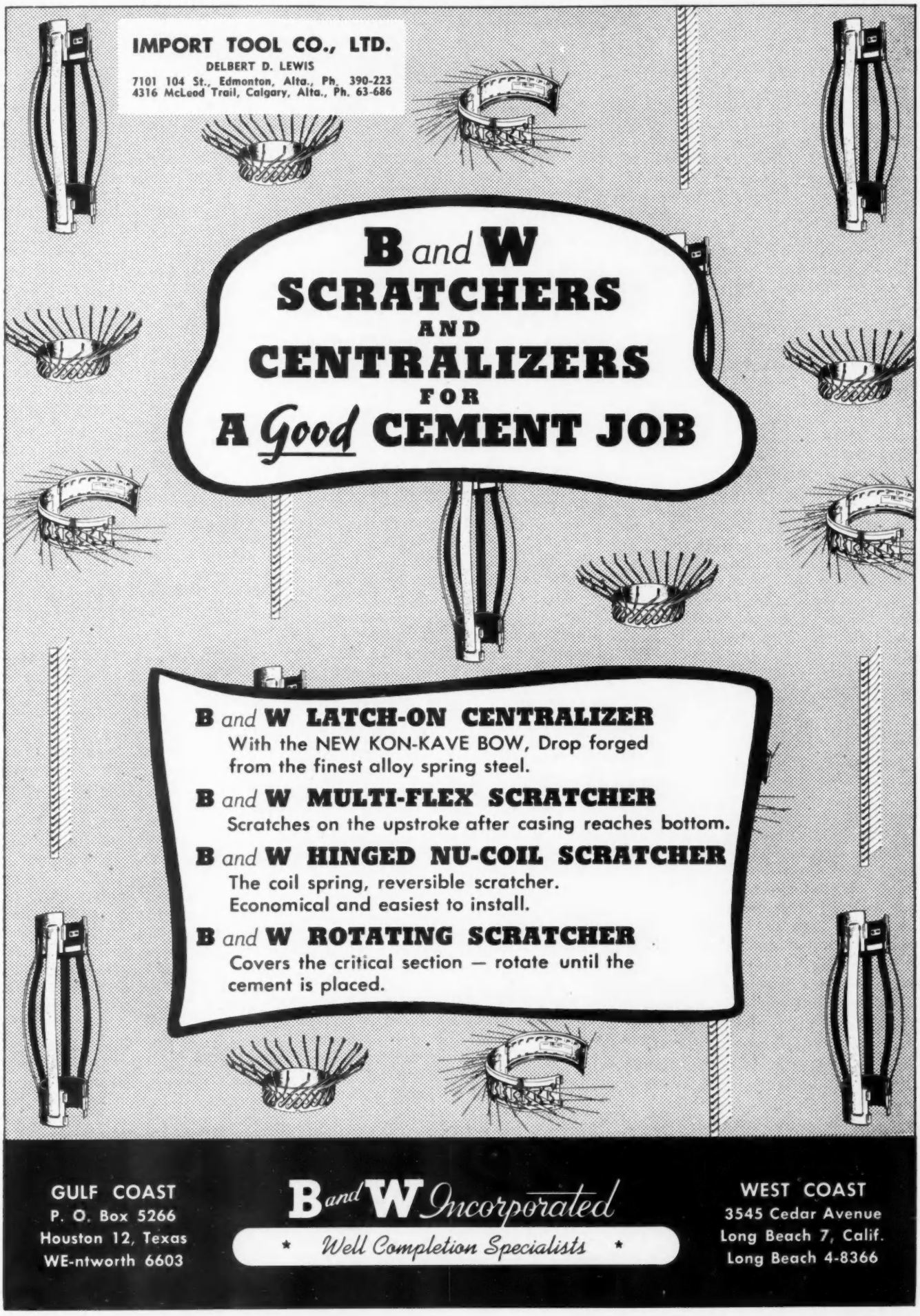


FIGURE 2. Wear curve for line twice minimum length when properly moved. (Derived from Figure 1.)

Wear Characteristics of Drilling Lines. In order to understand how to obtain better service from a drilling line, it is first necessary to understand how the line wears. This can easily be determined by examining retired lines which were not appreciably moved or cut during their operating life. Inspection usually reveals an almost identical pattern of wear in each case. Starting at the drum end, the portion which formed the base layer on the drum will be badly crushed and distorted where the second layer overwound it. But except for these points of contact, this part of the line will show little wear. At the turnback, moderate, nearly uniform wear and peening (flattening of the wires), will be found until about the midpoint in the length of the line is reached. Here a section, usually from 100 to 200 feet in length, will be badly worn and peened and will include a number of broken wires. This is the worn out portion which caused the line to be retired. Continuing the examination, past the worn out portion of the line and proceeding toward the dead end, an abrupt decrease in wear and a nearly complete absence of peening will be noticed. The last few hundred feet toward the dead end will show little or no evidence of wear. Figure 1 illustrates the "wear curve" for such a line.

Causes of Wear. If we were to replace any one of these retired ropes on the drilling rig from which it was taken, we would see that the wornout portion was the last part which wound on the drawworks drum when the traveling block was at the top, or pipe racking position. This is the portion of a drilling line which receives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maximum wear. Not only does it operate over nearly every sheave in the system but it is also subjected to maximum drum abuse. When the traveling block is raised to engage a stand of drill pipe, it goes up at high speed without load and during the last part of its upward travel, it coasts due to inertia with power off. As a result the line winds loosely on the drawworks drum and when the pipe is engaged with the block still traveling upward, a sudden load is placed on the line causing part of the outer layer on the drum to slip and scrub on the layer underneath.

This scrubbing, concentrated in a section approximately 100 to 200 feet long, about midway between the ends, is responsible for the maximum wear on a drilling line. So great is the increased amount of wear due to this drum abuse that the amount of fatigue and wear caused by passing over the sheaves becomes of minor importance by comparison. Nevertheless, it is essential to have sheaves which are properly grooved for the diameter of rope being used and of at least adequate diameter to prevent the possibility of fatigue failure at the dead line sheave from becoming critical. Sheave sizes[1] now in common usage do appear to adequately fulfill this requirement.

Two Ways Possible

From this discussion, two ways of increasing drilling line life become apparent. First, since scrubbing on the drum causes the accelerated rate of wear of a short section of the line, anything that reduces the amount or severity of this scrubbing increases rope life. Heavy loads and small drum diameters result in greater bearing pressures causing a reduction in drilling line life. Line service is also reduced by high drum and fast line speeds and by improper spooling.

Since loads, speeds and drum diameters are fixed by the drilling rig and field conditions involved, little can be done to reduce the severity of scrubbing except by improving the spooling characteristics of the system. Proper drum alignment, correctly operating wire line spoolers and a grooved drum are favorable to good line spooling.

Increasing Service by Moving and Cutting. A second method of increasing drilling line life is to use a line longer than is required to reeve the system and to move it at periodic intervals. Since only a relatively short section of a drilling line is subjected to the drum conditions which cause a rapid rate of wear, by changing the position of this section, the wear will be distributed over a greater length of line. Increased rope life results. The problem is to know just how much and when to move this section. To get maximum service from the line, it must be moved in such a manner that the cumulative wear received by each section of the line in successive moves through the system is just enough to "wear out" that particular part of the line at the time it reaches the drum end and is cut off. If the line is moved at too rapid a rate, no part of it will be worn out, and if it is moved too slowly, it will wear out somewhere back in the system requiring the cutting of good rope to eliminate the worn out portion of the line. In either case, a loss in service results.

Uniform movement of the line at a rate which is in proportion to the rate as which the line is wearing must be accomplished if the economics of a moving and cutting program are to be realized. The problem is to know when and how much to move the line. Unfortunately, visual inspection cannot be relied on to determine the proper moving rate for the line. Since the portion of the line which wears most rapidly is always about 600 to 800 feet from the drum end, inspection would involve determining the amount of wear present at this critical section. The amount of wear must be just sufficient so that the additional wear which this portion of the line will receive as it is moved progressively on toward the drum end will result in this portion of the line being worn out when it does reach the drum end.

Most Common Failure

The most common failure when visual determination of the time to move the line is attempted is to move it too slowly, allowing too much wear to occur at the critical point. As a result this most worn section of the line "wears out" before it reaches the drum end and a major cut of several hundred feet must be made to eliminate the worn portion. Whenever a tour report shows a drilling line cut of 300 or 400 feet, it is a safe bet that moving the line too slowly was the cause.

Determination of Moving Rate. Since it is not possible to decide reliably by visual inspection when the line should be moved, the pre-determination of the proper rate to move the drilling line in proportion to the rate of wear is the key to any sound moving and cutting program. So many variables affect the rate at which the line should be moved that this "moving rate" must be determined for each class of drilling rig by experience obtained from actual trials with one or more lines. Although it is possible for one who is experienced in developing moving and cutting programs to make a reasonably accurate first guess at the value to use for this "moving rate," the best method is to derive the first trial value from an estimate of the total number of ton miles of service which can be obtained from the line.

This is done as follows: Subtract the number of feet of line required to reeve the system from the total length of line to be used. The result will be the extra amount of line which can be moved through the system. Since the total number of ton miles of service the line will yield must be obtained while the extra line is moved through the system, the rate of movement is simply the number of ton miles of service expected divided by the number of feet of extra line available for

About the Author

J. N. KEMPLE was born March 14, 1921, in Ontario, Calif. Following graduation from Ontario High School, he attended Glendale (California) Junior College from 1940 to 1942. In July, 1942, he entered the Naval Air Corps as a cadet. He served two tours of duty in the Pacific as a pilot and, in 1945 was released to inactive duty. He entered Stanford University in 1945 and graduated in 1947 with a B.S. in engineering. In December, 1947, he joined Columbia Steel as a staff assistant in the wire rope mill. In May, 1948, he was appointed foreman in the wire rope mill and later served as foreman in various other departments. In June, 1949, he was transferred to the Los Angeles sales office as a technical sales representative. In October, 1951, he went to San Francisco as manager of wire rope and electrical wire products sales.

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moving. For example: Assume a 1⅛-inch x 2500-foot drilling line is to be used on the average medium depth rig and that 1500 feet of line is required to reeve the system. Reasonable service for this line would be about 12,500 ton miles. The length of line available for moving is 1000 feet (2500—1500). The trial moving rate, therefore, would be 12,500 divided by 1000 or 12.5 ton miles per foot. That is, the line should be moved at the rate of one foot for every 12.5 ton miles of work performed.

The most important variables which affect the moving rate are: The dimensions and speed of the drawworks drum and the diameter, construction and length of the drilling line. The proper moving rate increases rapidly as the diameter of the line and drum increases. Changes in the length of the drilling line, however, will cause the greatest variation in the moving rate. (Note: An increase in the numerical value of the moving rate results in a decrease in the amount of line moved since the units involved are ton miles of service per foot of line moved. Failure to consider the length of the drilling line to be used is probably the most common error in the formulation of a moving and cutting program. Perhaps an example will best show why the moving rate does vary with line length.)

Variation of Moving Rate with Line Length. Assume a drilling line twice as long as that required to reeve the system is moved at the proper rate in proportion to the rate of wear so as to provide maximum line service. The wear curve would be as illustrated in Figure 2. The first section cut off would have received almost no wear. Each succeeding cut would be of more worn rope until the last cut. The portion that originally was at the dead line end, would be completely worn out. As the figure shows, the most worn section of rope has been progressively shifted to the drum end. At this point, any further increase in drilling line length will not alter the shape of the wear curve except to extend the central portion of maximum wear. Additional cuts which would be possible with drilling lines longer than twice the minimum length would all be of worn out rope. Any shorter drilling line will always wear out somewhere between the point at which a minimum length line would have worn out and the drum end. Since the most worn section of line can only be shifted toward the drum end by an amount proportional to the length of the extra line available for moving, the proper moving rate for such an intermediate length drilling line would be slower than that for a very long line and should be chosen so that it will be necessary to retire the line just after the last of the extra length has been cut from the drum end. Curve 2 of Figure 2 illustrates the loss in service which results from moving an intermediate length line at the rate applicable to a longer line.

To illustrate just how rapidly the moving rate does change with variations in drilling line length, if the previously described 1⅛-inch line were 2000 feet long instead of 2500 feet, there would be only 500 feet available for moving. Reasonable service for such a line would be 9000 ton miles and the moving rate would have increased from moving one foot for every 12.5 ton miles to one foot for every 18 ton miles.

Frequency of Moves and Cuts. Ideally, a drilling line would be in constant motion through the system at a rate of movement which would vary with changes in the drilling cycle so that the rate of movement would always be in proportion to the rate of wear. New line would be fed into the system at the dead end and worn rope would be cut from the drum end. This, of course, cannot actually be accomplished. The line can only be moved at intervals. However, the same ratio of ton miles of wear to feet moved can be maintained. Therefore, just what interval of movement to choose becomes an economic consideration.

Shifting the Line

In addition to moving the line at the proper rate so as to distribute the wear, the position of the line at the dead sheave must also be shifted at least a short distance and at rather frequent intervals to prevent the possibility of breakage from fatigue at that point. How often the position of the dead line must be shifted is dependent upon sheave and rope diameters, hook loads and the type of formation being drilled. Moving frequencies at the dead line sheave of from 200 to 1000 ton miles have all been used safely with the larger sheave and rope diameters, lighter loads and lesser amounts of vibration favoring less frequent moves.

It would be ideal if the frequency of moving the line for the distribution of wear and the frequency at which the line must be moved over the dead line sheave to prevent fatigue breakage were the same. However, the position of the line on the dead line sheave can be changed in approximately 15 minutes by merely adding more line to the system at the tie-down, but the points of wear can be changed only by moving the line through the system and cutting a length from the drum end. This requires about an hour on the average. Therefore, it is seldom economical to make cuts from the drum end as often as the line must be shifted over the dead line sheave. At an average of roughly $40 an hour rig time, no cut should be made in the line until it will save at least a like amount in line service. For this reason, cuts should seldom be less than 40 feet or more than 125 feet in length. When the line is moved over the dead line sheave, normal procedure is to move it an amount which is in proportion to the moving rate and to choose a cutting frequency which is the proper multiple of the movement frequency over the dead sheave so as to provide uniform cuts of the desired length. If this method is followed when cuts are made, it is simply a matter of removing the extra line which has accumulated on the drum due to the moving.

Summary. These are the quantities which must be determined in order to formulate a moving and cutting program: The moving rate, the dead line moving frequency and the length, and, therefore, the frequency of cut. Average ranges for these values as used on a number of trial installations with most common diameters of drilling lines used in California fields are shown in Table 1.

The moving rates listed in Table 1 apply only to drilling lines at least twice the minimum length. Devising a sound, workable moving and cutting program for any given set of conditions becomes relatively simple once the moving rate and moving interval have been selected. Although not essential, it is easier to move the line over the dead line sheave uniformly. To determine how much to move, simply divide the dead line moving frequency in ton miles by the moving rate. If, for example, a moving frequency of 500 ton miles and a moving rate of 20 ton miles per foot

TABLE 1

Line Diameter	Dead Line Moving Frequency—Ton-Miles	Moving Rate Ton Miles Per Foot	Length to Cut—Feet
1 inch.....	200– 500	5– 9	30– 75
1⅛ inch...	400– 700	8–12	40–100
1¼ inch...	700–1000	14–20	50–125

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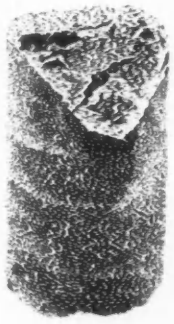

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were used, the line would simply be moved 25 feet every time 500 ton miles of line service had accumulated. It is also desirable to cut uniform lengths from the drum end but the length of cut must be in proportion to the moving rate. If a 20 ton mile per foot moving rate is used, all cuts made should be one-twentieth as many feet in length as the ton miles service accumulated since the previous cut. As previously stated, it is always best to select a length of cut which is a multiple of the length of movement over the dead sheave. For example, if 25 feet moves are made, cuts might be 75 feet long. When this is done, cutting becomes simply a matter of removing the excess length of line which has accumulated on the drum due to moving.

Having all the required information, all that remains to be done to install a moving and cutting program is to put data in a form crewmen on the rig can understand and follow.

Moving and cutting programs may be presented in many forms but perhaps the simplest and most universally used is to specify the amount to move and the number of ton miles for each move. Here is a comparable program applied to a drilling rig in the Ventura field: The drilling line used was a 1¼-inch diameter 3500-foot Seale patent plot steel drilling line with wire rope core—

Moving Rate:	20 ton miles per foot
Moving Frequency:	800 ton miles
Length to move then is:	800 divided by 20 or 40 feet

and this 40 feet will be moved every time 800 ton miles of wire line service has been accumulated.

Calculating Trips

Knowing the weight of the traveling block assembly, the drill pipe and the drill collars, the number of round trips to any depth required to accumulate this 800 ton miles can be calculated from the API ton mile chart 2. In this case, the weight of the block assembly and buoyed weight of the drill collars was approximately 30,000 pounds and the number of round trips required to accumulate 800 ton miles at each depth range is shown in Table 2.

The number of trips required for each move at shallower depths is so large that the figure is practically useless for the determination of when to move since only a very few trips are actually made at the shallow depths. In this case, it was known that about 800 ton miles were accumulated in drilling to 6000 feet. Therefore, the program was established in this manner: Move the line 40 feet when a depth of 6000 feet is reached. Thereafter, move as follows:

6,000- 7,000 feet—Move 40 feet every six round trips

7,000- 8,000 feet—Move 40 feet every five round trips

8,000- 9,000 feet—Move 40 feet every four round trips

9,000-10,000 feet—Move 40 feet every three round trips

10,000-11,000 feet—Move 40 feet every three round trips

11,000-12,000 feet—Move 40 feet every two round trips

It was decided to cut the line in 120-foot lengths. Therefore, it was specified that the line be cut every third move.

Benefits of Program. How much does such an engineered moving and cutting program save as compared with haphazard methods? A survey by the American Association of Oilwell Drilling Contractors revealed that the average service reported for a 1¼-inch line was only 6½-ton miles per foot. The service for the line in the above example was over 11. This is an increase of nearly 80 percent. Moreover, the cost of moving and cutting according to this program was no greater than with the previous method involving only visual inspection. The savings are made possible not by an increased number of moves or cuts but by moving and cutting the proper amount at the proper time. In another instance, a 5000-foot, 1¼-inch line was used to drill three complete wells to a depth of around 13,000 feet and drilled a good share of a fourth well before being retired. Total service for the line exceeded 70,000 ton miles. This is over 14 ton miles per foot or over 2⅓ times as much service per foot as would have been obtained with lines of average length used without a well-planned program. Over three times as much service was obtained from this line as would have been obtained from lines of average length used without a well-planned program. In addition, two drilling line changes, which would have been necessary with the average lines and methods, were completely eliminated; thus preventing the loss of several hours of drilling rig time which would have been required to change drilling lines.

TABLE 2

DEPTH RANGE	Round Trips
0 feet— 1,000 feet	131
1,000 feet— 2,000 feet	40
2,000 feet— 3,000 feet	20
3,000 feet— 4,000 feet	13
4,000 feet— 5,000 feet	110
5,000 feet— 6,000 feet	8
6,000 feet— 7,000 feet	6
7,000 feet— 8,000 feet	5
8,000 feet— 9,000 feet	4
9,000 feet—10,000 feet	3
10,000 feet—11,000 feet	3
11,000 feet—12,000 feet	2

Savings Possible

An engineered moving and cutting program has an increasingly fertile field for making large dollar savings in drilling line costs as the depth of the well and the length of the line increase. Therefore, the longest length of line which can be economically handled should be used. On small drilling rigs which operate around 5000 feet or less, many operators believe that due to the short period of time required to drill a well, the extra cost of the time required for handling a long line when rigging up and tearing out the drilling rig offsets the benefits obtained from the moving program. Regardless of drilling rig size and depth of operations, real cash savings may be passed up if the comparative cost of using maximum length lines and an engineered moving and cutting program is not at least tried. Such programs are tailored individually with a consideration of the kind of drilling rig and equipment, the formations to be drilled, the kind, diameter and length of the drilling line and sometimes even the personnel on the rig. Such programs cannot be standardized but are based on an understanding of how a drilling line wears and of the variables which go to make up moving and cutting programs.

These programs may be a little more trouble to develop initially than standardized methods which involve a fixed moving interval, but only such a program tailored individually, can possibly provide maximum economy in drilling line operation under all conditions. Such programs have frequently reduced costs for drilling lines to less than one-half their former value. Results do, therefore, seem well worth the time and effort required to develop them.

REFERENCES

[1] API Recommended Practice on Application, Care and Use of Wire Rope For Oilfield Service, API, RP 9B, Section III.

[2] API Recommended Practice on Application, Care and Use of Wire Rope For Oilfield Service, API, RP 9B, Section V.

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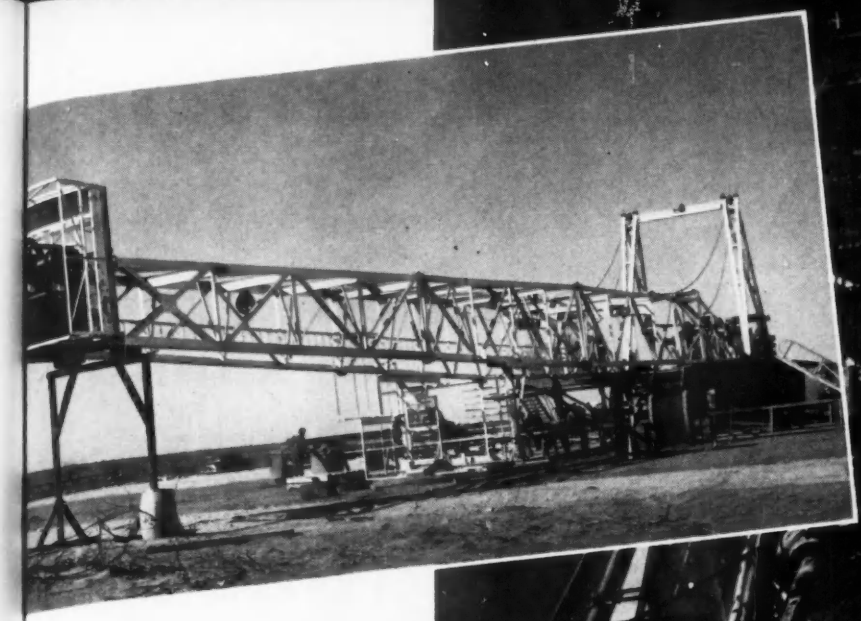

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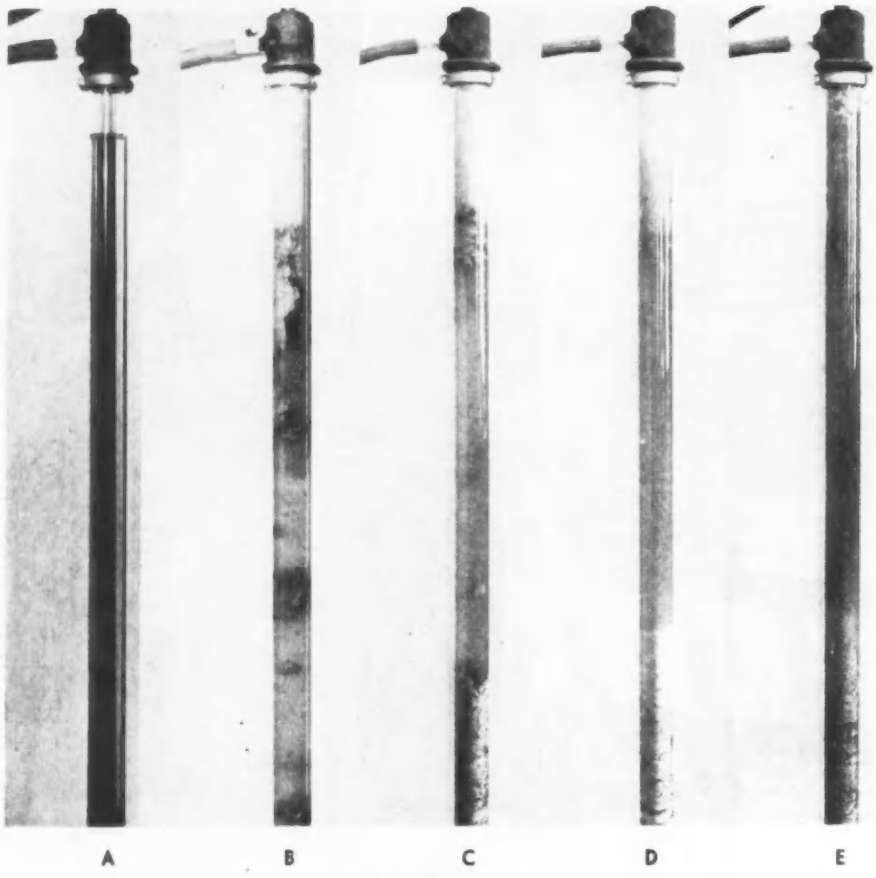

FIGURE 1
Concentrically-mounted glass tubes represent casing string and drilled hole in apparatus for experminating with mud solvents.

New Chemical Product Removes Mud Cake

Improved technique plus solvent which flocculates and dissolves may become a major development in primary cement applications.

By ZANE V. MORGAN
Texas Acidizers, Inc., Seguin, Texas

IN RECENT YEARS the industry has been aware of the need for some means to scavenge drilling mud from the wall of a hole in order to prevent mud contamination of a cement slurry, to minimize the possibility of channeling and to clean the formation face so that the cement will bond to it. This would obviate the extra expense and time used in block squeezing. It would insure segregation of production fluids—gas, oil and water—to their original zones, making selective perforating much more effective.

While the idea of acidizing ahead of long-string cementing has been considered with variable enthusiasm for some time, there is now an effective chemical development that will displace mud cake readily without interrupting the cementing operation. As there are several things to consider other than removing annulus mud, this product appears as the closest approach to answering all requirements and to minimizing the possibility of trouble or damage to a well.

Two separate actions are involved in mud removal by this chemical flocculation and dissolution. Disintegration alone would probably be sufficient to achieve a clean wall. And while flocculation is a definite aid to the chemical reaction, a secondary purpose of the flocculant is to bring about complete neutralization of the chemical, for flocculation permits downward movement of the annulus mud into the relatively lightweight chemical during the period immediately after the cement has been pumped into place behind the pipe. This amounts to gravitational displacement. It persists until all of the

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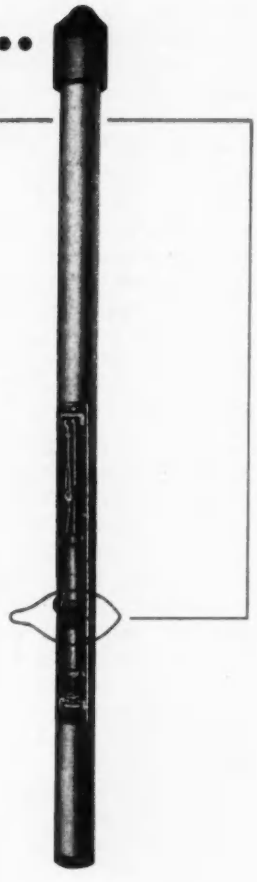

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This Bourdon Tube goes down the hole along with the Standard PRD. You get *both* records right after the test. Exacting engineers and geologists *want* both records – for the greater accuracy of the B. T. can make a whale of a difference.

Absence of packing glands in the Bourdon Tube make it *supersensitive* to the slightest variations of pressure changes. It is run with a blank chart made from sheet copper specially treated to withstand high temperatures of present day deep drilling. Clocks used to drive the B. T. are specially designed to withstand shock and high temperatures.

It is supplied in pressure ratings from 5,000 psi. to 15,000 psi. The base line or zero pressure line is drawn after the instrument is assembled. Recordings are measured in inches of deflection and converted to pressure from a calibration curve. The pressure readings are corrected to the bottom hole temperature of the well tested.

Halliburton's Testing Specialists are equipped to make field readings of the chart right after the test. But these readings are checked at the laboratory on a Micrometer Optical Chart Reader. You get a complete data sheet plus a *photographic* copy of the chart – leaving no chance for human error.

This big bonus of testing accuracy is yours at no extra cost. Make sure you get it on your next test. The Bourdon Tube is exclusive with Halliburton, so phone your nearby Halliburton Tester. Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

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chemical is intimately dispersed within the mud and rendered non-active as well as non-corrosive to the pipe.

It is realized that in many cases irreparable damage to oil and gas wells has been caused by channeled cement or faulty bond surrounding the production pipe string. Many conventional acidizing jobs have failed to increase production. A considerable number of these failures can be attributed to stray injection of the chemical via mud channels behind the casing. The assumption is not based upon direct evidence but rather upon the reasonable elimination of other possibilities.

Mud acid ahead of primary cementing has been tried in several instances. A water spacer of several barrels precedes the acid to prevent spending of the acid on the circulating mud and to displace a part of the mud cake from the hole. A similar water spacer is run between acid and cement slurry to prevent reaction with the slurry.

A typical example: 1500 gallons of mud acid were run ahead of 350 sacks of cement in a well 11,000 feet deep in the Tuscaloosa Sand in Mississippi. Twenty barrel water spacers were run before and after the acid solution, followed by the cement slurry. Drilling mud was used to displace cement to bottom with the rig pump. A minute-by-minute log of pressure and observations was kept throughout the displacement period until the plug reached bottom. At a certain point the mud stream returning to the pit diminished to approximately 30 percent of normal. This decreased return persisted for 95 seconds whence it increased abruptly to normal.

Interpolating backward from the time at which plug bumped shoe the positions of the acid and cement were correlated with respect to points of diminished and restored returns. Later comparison with electric log corroborated these calculations reasonably well by showing the probable section of highest porosity where the acid, after dissolving mud cake, began slow invasion of the formation. This caused diminished mud return which was quickly restored as soon as the cement reached the point of invasion, resealing the face of the formation. Incidentally, 83 percent of the acid had passed this section before invasion commenced.

In this particular oil field it was customary to remove mud cake from the well bore mechanically and block squeeze below and above production zone before perforating for completion. Block squeeze pressures at 5000 to 6000 pounds per square inch were believed to be desirable. The well under discussion was not mechanically conditioned for cake removal and block squeezing was done merely because of policy, after original cementing of the pipe. Similar amounts of cement were put away and normal pressures encountered in block squeezing this well as compared to other wells in the area. No extraordinary developments could be observed in the final completion. It is probable that block squeezing would have been unnecessary to the successful completion of this well although there is no tangible evidence to support this belief. It seems reasonable to assume however that since the acid had dissolved mud cake opposite a porous section of formation—where incidentally the mud cake should be thick due to an accumulative buildup when water content is lost by invasion into the relatively large interstices—it would likewise dissolve cake in the non-porous intervals where cake is extremely thin. In fact the cleaning efficiency of the acid should be highest opposite the denser rock sections which also happen to be the critical points where good bonding of cement and formation is most desirable for isolation of the various fluid-bearing zones, each to itself.

In the past the main condemnation of mud solvents used ahead of conventional cementing was the corrosive action of the solvent to steel equipment and more especially the possibility of their corroding through the production casing. Except for this reason mud acid might have gained acceptance as an aid to long-string cementing, for its solvent efficiency is well known. It has come into wide use as a formation conditioner ahead of cement squeeze.

Perhaps the number two objection to running acid ahead of long-string cementing operations is the possibility of breaking down a porous zone and losing acid plus cement into it. As shown in the above case a major part of the acid had already passed the point where invasion took place and furthermore circulation did not cease altogether but merely decreased instead. This meant that the acid was still rising in the annulus even while some invasion was happening. And of course full circulation came about as soon as the cement reached the point of loss.

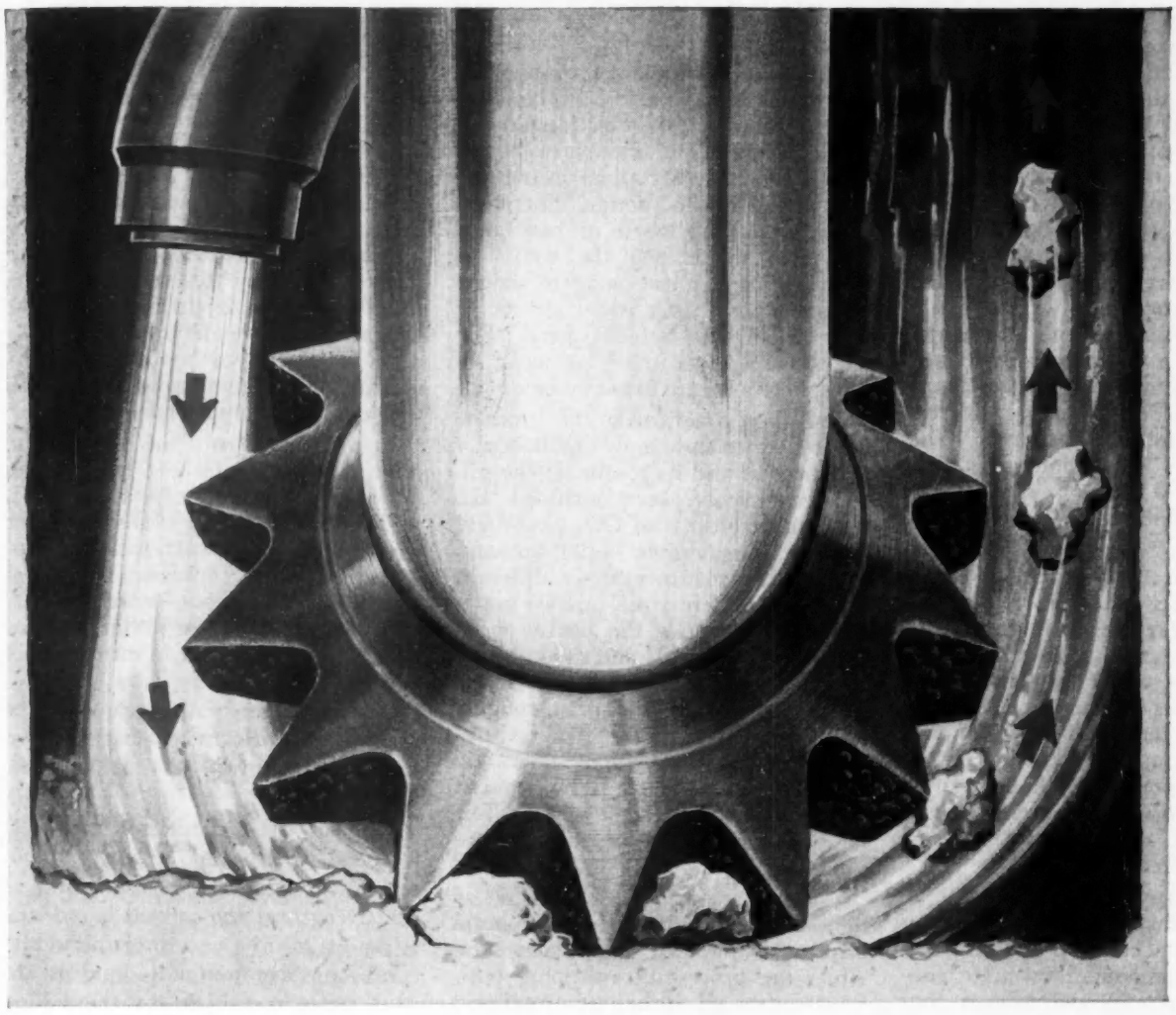
Generally, as rock compaction increases with depth, porosity and permeability systematically decrease with depth so that except for abnormalities such as crevices or fractures, the deeper formations will resist rapid invasion. Sandstones in particular exhibit this resistance because primary permeability is not appreciably increased by acid reaction. If acid reaction did rapidly increase permeability to a dangerous degree the chances of achieving successful cement jobs would be very slim.

Therefore as a safety measure to prevent large scale loss of fluids to the formation it is recommended that a sealing material be mixed into the foremost portion of the cement slurry. The preferred sealing agent is an expanded volcanic silicate of which much is known by most operators. The material itself is a good scavenger of mud cake because of its angular particles and hardness. However, in this case its purpose would be to seal off porous zones and prevent loss of solvent and cement. It should be mixed into the first part of the cement slurry at approximately three cubic feet per each sack of cement. This ratio being reduced to two cubic feet per sack at the end of the seal-cement mix. That fraction of the total cement slurry which carries the seal should be roughly the first quarter.

However consideration of several factors will change this from one area to another. On the first job for any given area an excess of cement and seal should be used. Permeability and porosity analyses of cores or sample cuttings should be considered prior to each job for detection of unusual weak zones. The information in some cases may help in the anticipation of fluid loss during the job and in the estimation of materials required. Certainly such data should be valuable for later reference. From observations made during each job technique could be improved for future jobs.

Number three objection to acid ahead of cement was the possibility of acid-cement contact with consequent disintegration of the cement and danger of flash set. Both these actions are possible but highly improbable. Formation water having high chloride content is similar to acid and spent acid in this respect and will cause flash setting of the cement. However with an adequate fresh water spacer between solvent and cement slurry there is little likelihood of trouble brewing from this source. Since several thousand acid-ahead-of-cement squeeze jobs have been performed to date with no known unfavorable reports due to flash sets, the procedure must be fairly safe.

The quantity of solvent necessary to achieve a clean hole can be cal-



This mud flow pattern makes faster drilling possible

Slush from the nozzles of **REED** Twin-Blast Rock Bits blasts against the bottom of the hole and sweeps across at high velocity — carrying cuttings up into the return mud stream immediately so cutter teeth can work on virgin formation.

The result of this efficient bottom hole cleaning action is faster drilling, more hole per bit, fewer round trips and lower drilling costs.

REED ROLLER BIT COMPANY
Houston 1, Texas

culated within reasonable limits for the sake of economy. Assuming that the first water spacer will displace 75 percent of the annulus mud ahead of the solvent, this leaves 25 percent of the annulus mud as wall cake to be dissolved by the solvent. This volume is also 25 percent of the cement slurry volume. Therefore take one-fourth of the estimated slurry volume, convert to gallons and multiply by existing mud weight. Since through flocculation and disintegration one gallon of solvent will remove 3.5 pounds of mud the resultant figure should be divided by 3.5 to give the gallons of solvent required. This figures out to 750 gallons of solvent required for a 200-sack cement job; and 3700 gallons solvent for a 1000-sack job.

Total reaction of solvent and mud products takes place in about five minutes at surface temperature. In deep wells reaction time is shortened by the higher temperatures. Thus in nearly all cases it would not be necessary to slow the pump in order that the solvent completes reaction on the mud in that portion of the hole to be cemented. Normal cementing speeds should permit sufficient contact time for complete reaction.

A simple apparatus depicted here serves to illustrate the continuous processes of flocculation and displacement with consequent intimate contact between mud and solvent that brings about total neutralization of the solvent in a very short time as would take place in a well annulus during the waiting on cement period.

A ¾-inch outside diameter glass tube representing casing string is mounted inside a 1⅝-inch inside diameter glass tube which represents drilled hole. Bottom of large tube is plugged, and circulation is possible through ports near bottom of small tube. In figure 1-A the system is nearly full of water with a colored solution inside the small tube merely to give pictorial sense to the apparatus.

Colored solution was reversed out and a quantity of the flocculating agent without the solvent chemicals equal to more than annulus volume was pumped into annulus followed by an oil-base mud of 16-pounds-per-gallon density. This was done in reverse to prevent smearing of glass system by mud. When sufficient mud for purpose of experiment was in—approximately one-third of annulus volume-pumping was stopped and fluid system was held static throughout observation period. Figure 1-B is photo taken at moment pump was stopped. It shows that rather rapid downward movement of mud flocs is already taking place.

This experiment was previously performed using various muds and solvent solutions. For oil base muds it was found that a surface active chemical used as a coupler in the solvent aided the floc action. Therefore on an actual job where oil base mud was used in drilling the well this coupling agent plus floc agent should be used in the first water spacer as well as in the solvent itself. For water base muds only floc agent in the spacer appears to be necessary.

The glass apparatus in this instance was set up to show only the flocculation process and its results. If the solvent chemicals were included the resultant evolution of CO_2 gas would set up considerable agitation and thereby present an entirely different picture. As there is calcareous material in most muds the liberation of gas during solvent-mud reaction at atmospheric pressure is inevitable because pressures less than roughly 500 psi will permit the escape. Pressures above this prevent liberation and therefore in a hole full of mud at depths beyond 1000 feet there will be no gas disturbance of the annulus fluids.

For this reason there should be no molestation of the cement column after it is pumped into place. And while the process of swapping positions continued on between mud and solvent there still would not be movement of the annulus fluids taken as a whole. As the flocing chemical is effective in extremely low concentrations it would be quite practical to add enough of the chemical to an average solvent volume to flocculate all the mud left in the annulus of a 10,000-foot well. Should this be done it may be assumed that the spent solvent solution eventually would be displaced all the way to the top of the mud in the annulus. Should only a small amount of the material be added to the solvent displacement would continue until flocculant became nearly usurped at which point perhaps diffusion of mud into spent solvent solution would arrest further displacement.

Figure 1-C shows flocs building up in bottom of annulus. Giving a spongy appearance at first, the flocs continue to settle downward displacing the solution and finally forming a rather compact mass. Segregated small volumes of solution unite to form breaks in the mass, and continuously work upward as the mud settles.

Figure 1-E shows the last of the mud at top being flocced and moving downward. Total time lapse from 1-B to 1-E was 29 minutes. Displacement was three feet in a 7/16-inch annulus. At this rate the solution in a well annulus should move upwards 1000 feet in a week or less. Which means that the spent solution (approximately 600 gallons) resulting from an original 750 gallons of solvent would be in contact with the casing for not longer than three days at any one point.

Now as the original solvent is effectively inhibited against high-temperature metal corrosion, and as the strength of the solvent is reduced to neutrality in a very short period by continuous contact with mud it appears that metal-loss to the casing string would not become a serious factor.

Table 1 gives metal weight losses due to corrosion of various fluids on J-55 steel coupons. Coupons were immersed in fluids for 45 days at surface temperature. Hard rubber composition receptacles were used for tests.

Similar tests were made at temperature of 205° F. for a total of 70 hours. Results are shown in Table 2. pH of spent solvent is 6.8

In these tests an extremely stable chemical inhibitor was used for high temperature inhibition. Inspection of the coupons showed uniform attack rather than localized pitting. Metal surfaces of coupons taken from clay solvent solutions appeared dark gray with dull luster.

It is assumed that while corrosion tests made under surface conditions cannot be compared to what actually happens at least they do indicate whether or not corrosion from the solvent is of mild enough nature to justify its use in deep wells. The above figures appear favorable in this respect.

Table 1

FLUID	PERCENT LOSS	
	Full Strength	Spent
Mud acid	0.96	0.17
Clay Solvent	0.81	0.04
Formation brine pH=6.7 CO_2=203 Sp. G.=1.02	0.76	.....

Table 2

FLUID	PERCENT LOSS	
	Full Strength	Spent
Mud acid	1.38	0.31
Clay solvent	0.94	0.16
Formation brine	0.87	.....

Rules for Increasing Life of Tool Joints

Lubricant and swab should be free of dirt.

Clean and lubricate pin and box.

Use lubricant recommended by tool joint manufacturer.

Hand tong new tool joints.

Don't spin new joints (in or out) at high speeds.

Damaged tool joints should be removed from service.

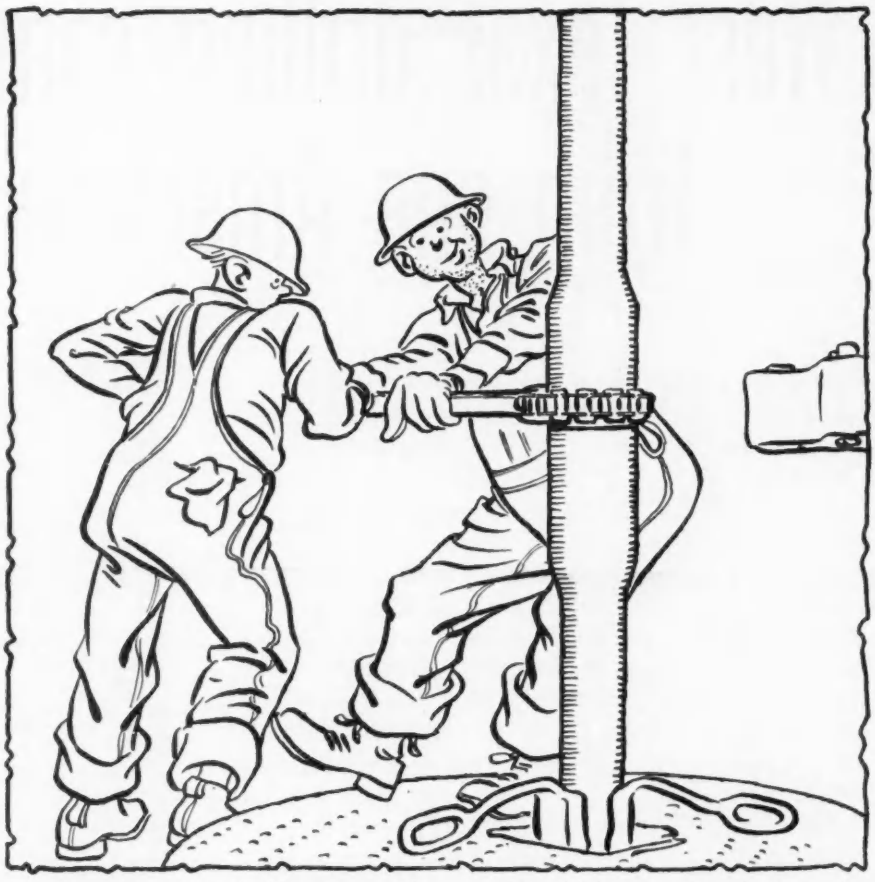
Don't bend a joint by torquing too high in the slips.

Use tong torque indicator when possible.

Never drag pipe on tool joint.

Use a dolly when tailing pipe in or out.

Inspect all pipe and tool joints between jobs.



DO Hand tong new tool joints after applying proper thread lubricant. Joints should be given special attention while being used on the first three or four wells until they are thoroughly worn in.

How to Care for Tool Joints

• Cleanliness and correct lubrication are essential to long thread life.

• Precise stabbing and care in spinning prevent damage and failure.

By F. C. GIGNOUX, Reed Roller Bit Company, Houston

TOOL JOINT care is a continuous job. It starts before the drill string is ever used and never stops until the joint is finally retired. The following suggestions on tool joint care are offered to help operators get longer service from their tool joints.

When Drill String Is New. The old adage "cleanliness is next to Godliness" applies aptly to tool joint care. Make sure *both* pin and box threads and shoulders, as well as lubricant and lubricant swab are perfectly clean before running a new drill string. If mill scale or other foreign matter is detected in new drill pipe, it is a good practice to steam clean the inside before the scale can get into threaded connections.

Always use a thread lubricant recommended by the tool joint manufacturer.

Brand new tool joints are most vulnerable. Threads fit closely when new, and even though they are carefully finished, they are more subject to galling than they will be after they are broken in. In an effort to minimize the danger of galling, a phosphate treatment can be used on the tool joint threads, which acts somewhat like a lubricant built into the threads. Even these treated threads can be damaged if abused, however, and should be treated carefully during the first few round trips.

New tool joints should be hand tonged in making up the string. The spinning rope or chain should not be used during the first several round trips. By the same token, new tool joints should never be spun out at high rotative speeds. New threads are easily burned.

Routine Care of Tool Joints. While going into the hole, both the box and pin tool joint threads and shoulders should be cleaned, inspected and lubricated before stabbing. If there is any evidence of nicked, scratched or drawn threads or shoulders, the damage should be carefully dressed out with a file of the proper contour, and all filings removed from the finished surface. If damage is too severe for this on-the-spot repair, the tool joint should be removed from service. Crews should be carefully instructed in the technique of using files and shoulder dressing tools. Correct filing can greatly extend the life of tool joints—incorrectly done, the tool joints can be ruined.

Coordination and precision on the part of the crew, together with proper maintenance of equipment, can go far toward lengthening the useful life of tool joints. The spring action of the hook should always be free and smooth. A good driller holds proper tension on the hook spring so that during break-out there is minimum pressure on the disengaging threads, yet every possibility of bumping the end of the pin on the shoulder of the

West Texas drilling contractor gets from one American Tiger Brand

THERE'S a drilling outfit in Midland, Texas that knows all the tricks for getting the most service out of its wire lines. It's the Karl B. King Drilling Company.

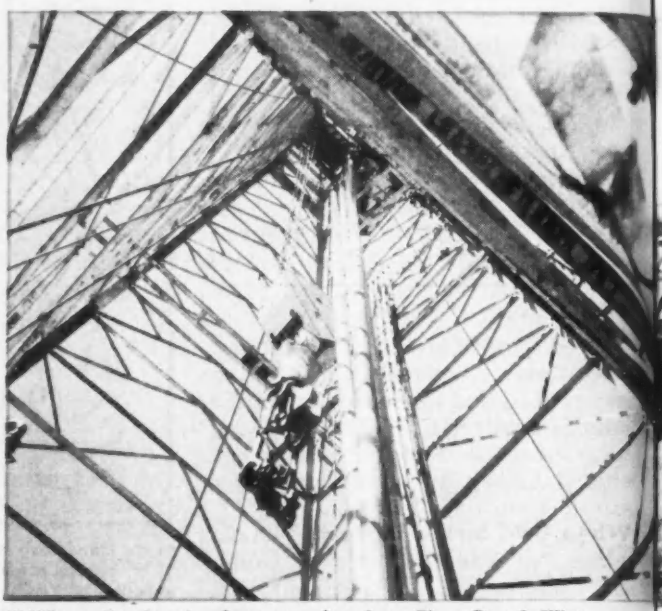
Here's how they did it. For many years, they kept accurate records of each wire line used and noted all the factors that had some effect on wire line life. One line gave 89,625 ton-miles of service. It drilled 23,200 feet of well and was used for 10 months. This was an American Tiger Brand 1¼" 6 x 19 line, Excellay Preformed, 5000 feet long with Independent Wire Rope Core. The cost of the line per ton-mile was the lowest of any of the lines tested.

Keeping ton-mile records of wire line service takes time but it is the best method known for determining which lines last longest and what factors do most to increase wire rope life.

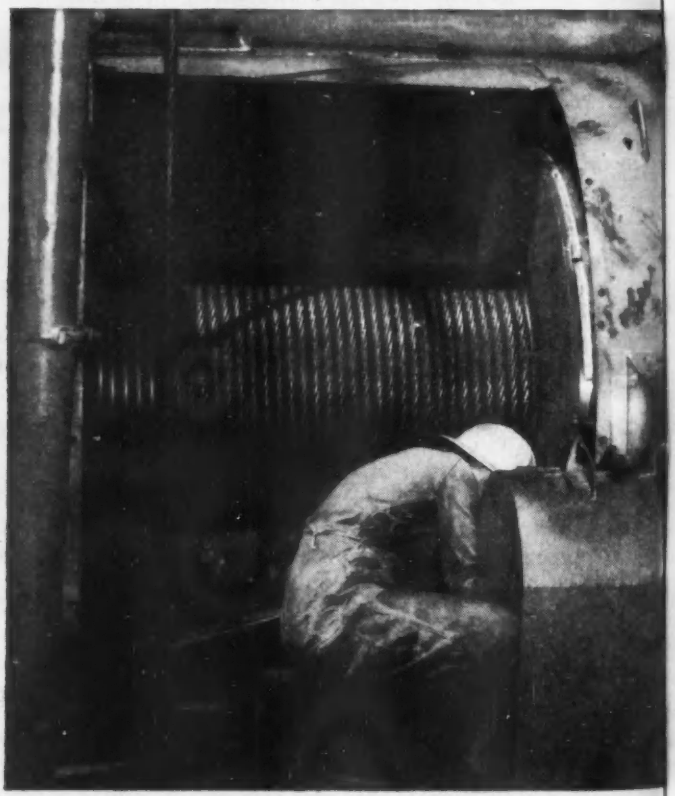
Factors that contributed to long rope life

1. Choice of a brand well-known for long service—American Tiger Brand.
2. Choice of the right construction and size—1¼" 6 x 19 (IWRC) Excellay Preformed.
3. Superior lubrication, applied at the factory, lasted the life of the rope.
4. Grooved drum reduced wear on rope.
5. Care in handling the rope kept it free from mud and sand.
6. Selection of a rope long enough so that an efficient moving and cutting practice could be effected.
7. Proper alignment of equipment.
8. Manganese steel sheaves were used and kept free from rough spots.

To help you get the most service out of your wire lines, American Steel & Wire maintains a Wire Rope Specialist in each oil field. He "knows his ropes" and can save you plenty of money by helping you set up better wire rope practices on the job. This service is available at any time through your local supply store.

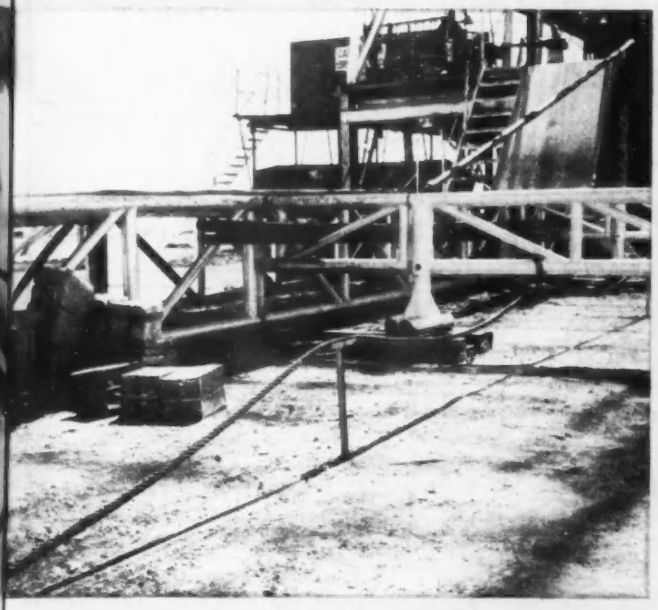


89,625 ton-miles of service from one American Tiger Brand Wire Line is considered far above average service in this area.



Cutting off worn end of line adds considerable ton-miles of service. So does the grooved drum.

89,625 ton-miles Wire Rope



Clean lines wear longer. Hand-made pipe stands keep line out of sand and mud.

Karl B. King Drilling Co. rig near Midland, Texas.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL COMPANY
GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S AMERICAN TIGER BRAND WIRE ROPE

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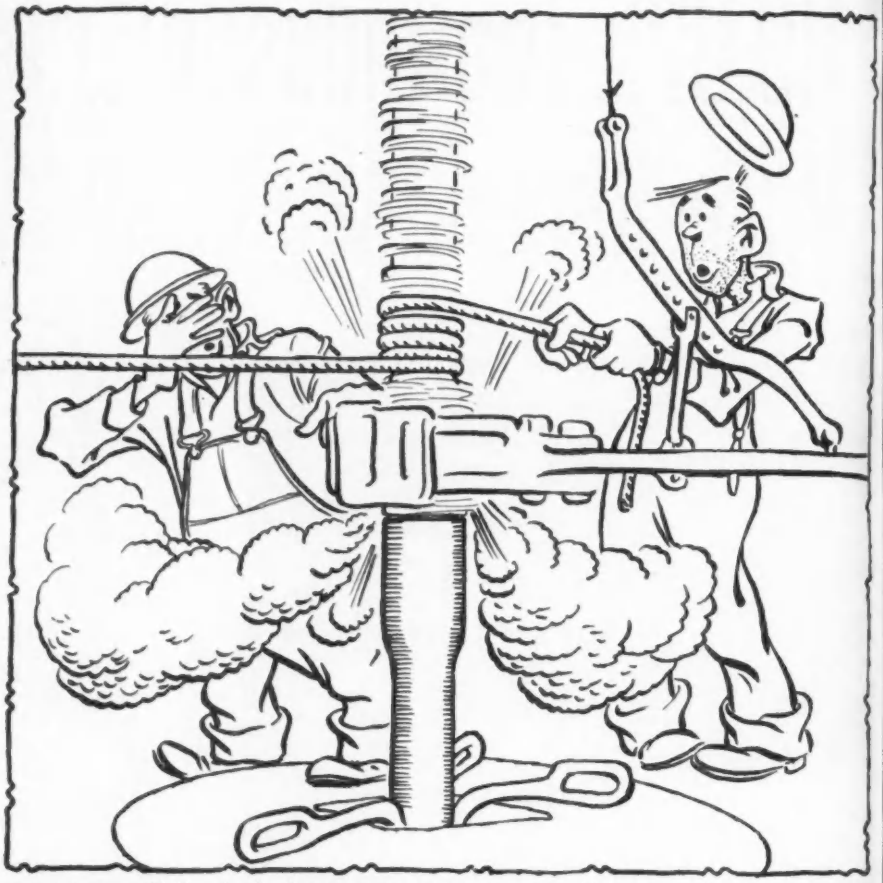
UNITED STATES STEEL

box is avoided. When a joint is stabbed, a good driller releases weight accurately so the full weight of the treble stand does not rest on the threads until they are run up.

The spinning rope should be used with care. It is not uncommon to see crews spin up connections so fast that smoke is visible from friction heat. Obviously, this will lead to damaged threads, ill-fitting connections and subsequent leakage. Speed in making trips is essential to profitable drilling, but much tool joint abuse can be attributed to the desire for speed. Every crew has to strive for the best compromise between speed and good tool joint care. This compromise constitutes one of the differences between a good crew and a poor one.

Final torque on make-up is important. Over-torquing puts excessive stress on the threads, while insufficient torque can permit a joint to rock—causing wear and premature failure. Torquing a joint held too high in the slips can easily spring or bend the drill pipe. The tool joint later takes undue punishment when this is allowed to occur.

Table 2 gives suggested torque limits. A tong torque indicator is strongly recommended to assure correct torquing. If it is not practical to use this instrument permanently, it should be used until each crew is thoroughly trained.



DON'T gall threads. Don't spin new joints in or out at high speeds. A good crew is fast but careful with tool joints.

DON'T drag pipe on tool joints. Always use a dolly when tailing pipe in or out. Thread protectors should always be left on tool joint until pipe is put on derrick floor, preparatory to running in the hole.

Careless handling in moving pipe from rack to derrick often results in damaged tool joints. Pipe should never be dragged on the tool joint. An adequate dolly should always be used. This dolly should also be used to tail pipe out of the derrick.

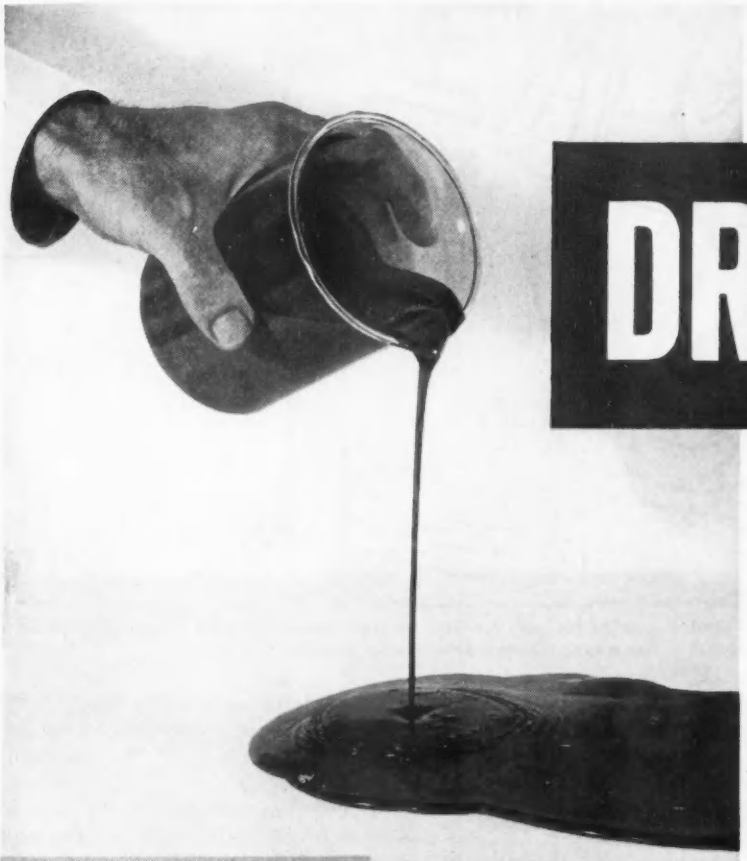
Care Between Jobs. At the end of a job, all tool joints should be cleaned, inspected and lubricated. Thread protectors should be placed on tool joint pins and boxes before the drill pipe is transported. All damaged pipe, or pipe with damaged tool joints, should be repaired before sending to storage or to a new location. All pipe should be checked for straightness, and kinks or bends should be removed. A little care between jobs will greatly extend the life of both pipe and tool joints.

Tool Joint Wear. Wear on the O.D. of tool joints from abrasive formations is probably the greatest single cause of tool joint replacement. Hard metal banding helps to reduce this wear adjacent to where such banding is applied. It is expensive and requires some calculation on the part of the operator as to whether the added investment pays out. Certain formations wear the tool joint excessively and uniformly over their entire length.

DEEP WELLS? HIGH HEAT?

Drill with

DRISCOSE*



Above: Driscose base oil emulsion mud systems keep their fluid stability even under aging at temperatures in excess of 325° F.

Left: Too often, other types of systems, under the same severe conditions, suffer gelation and solidification comparable to the concrete-like column in this photograph.

● Solidification? Gelation problems? Aging at high temperatures? *Not with Driscose!* You can rely on this high-stability mud under severe conditions of heat and heavy mineral salt contamination. Driscose stays on the job . . . controls water loss . . . acts as an emulsifying agent . . . greatly improves weight suspending properties.

In addition, a Driscose base, oil type emulsion mud does not flatten the spontaneous potential curve of the electric log. Permits accurate interpretation.

Driscose is easily handled. Soluble in hot or cold water. Packed in 50-pound, 6-ply, water-resistant bags. Order Driscose from your regular mud dealer.

*DRISCOSE *is a trademark for Sodium Carboxymethylcellulose*

DRILLING SPECIALTIES COMPANY

BARTLESVILLE, OKLAHOMA

In such cases, hard metal does little good except to protect the elevator shoulders. However, if the lower end of the joint indicates the greatest wear, hard metal is probably an economical answer.

Hard metal definitely helps to reduce return fluid erosion at the elevator shoulders, and with the advent of higher mud velocities, this problem may become more important. In some instances return fluid erosion can be reduced by decreasing the velocity of the return fluid. This can be done by either reducing drill pipe size or increasing the size of the hole drilled—thereby increasing the area of the annulus between tool joint and hole.

The use of drill pipe protectors often helps reduce tool joint wear This is especially true for joints which are being run inside of set casing.

The main causes of excessive wear on tool joints are crooked hole, directional drilling, fishing and sidetracking, insufficient drill collar weight, excessive rotary speeds, crooked drill pipe, etc. The last three causes are under the control of the operator.

Some operators practice reversing their drill stem at intervals. This consists of turning the stands end for end. Such a practice, it is claimed, does not reduce the efficiency of the rig and it does distribute the wear uniformly to each end of the tool joints and drill pipe. Obviously, this practice lends itself best to tool joints without hard metal bands.

In some instances worn tool joints can be rebuilt with some degree of economy. One method is that of resleeving the joint by attaching a steel sleeve to the outside of the worn joint. Replacement of hard metal protecting bands is a common procedure and is applicable to nearly any type of joint. All such salvage work is dangerous, however, unless expertly done. It is generally wise to use rebuilt tool joints where duty is known to be light.

How much wear can be allowed with a reasonable degree of safety should be determined by each operator after taking into consideration the type of rig, depth of well, formation and other factors. Table I shows a schedule of wear limit figures. This table is only a guide and should be amended according to the operator's specific conditions.

Operators differ as to the best location in the drill stem for the most worn tool joints. It is important, however, that joints be mated with respect to the O.D. of the halves. In other words, wide shoulders should not be mated with narrow ones.

There is no doubt that a concerted campaign by operators for better tool joint care will pay off in a big way. Such a campaign must have the cooperation of drilling crews, tool yard employes and transportation men. It, of course, should be sold to these employes in such a way as no. to overbalance or interfere with other factors leading to the low cost of oil wells.

DON'T bend a joint by torquing too high in slips. Lower the pipe in rotary table before tonging. Use a tong torque indicator when possible.

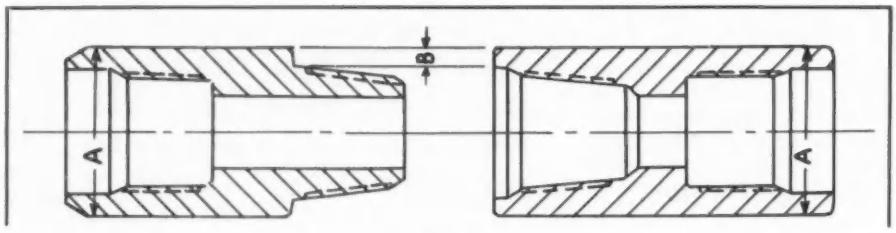


TABLE 1

(A) Minimum O.D. of Tool Joint on Drill Pipe End.
(B) Minimum Allowable Box Shoulder Width on Both Excentrically and Concentrically Worn Tool Joints.

Connection Size	API Regular		API Full Hole		S.I.F.		Internal Flush	
	(A)	(B)	(A)	(B)	(A)	(B)	(A)	(B)
2⅞"	....	3/16"	....	3/32"	....	....	3 13/16"	3/16"
3½"	....	3/16"	4½"	3/32"	....	¼"	4 7/16"	3/16"
4"	....	....	....	....	....	....	5⅜"	¼"
4½"	....	7/32"	5⅜"	3/16"	5⅜"	¼"	5¾"	7/32"
5"	....	....	....	....	5¾"	7/32"	....	....
5½"	6½"	3/32"	6½"	3/32"	....	....	....	....

NOTE: The above figures are only a guide, and in some cases may not be applicable, especially when other general conditions of the connection are taken into consideration.

TABLE 2

"Make-Up" Torque for Tool Joint

Below are listed a suggested "make-up" torque for all sizes of Regular, Full Hole, Semi-Internal Flush, and Internal Flush Tool Joint:

Nominal Size, Inches	Torque—Ft.-Lbs.	
	Minimum	Maximum
2⅜"	3,000	4,000
2⅞"	4,500	6,000
3½"	8,000	10,500
4½"	12,000	17,000
5½"	15,000	20,000
6⅝"	18,000	24,000

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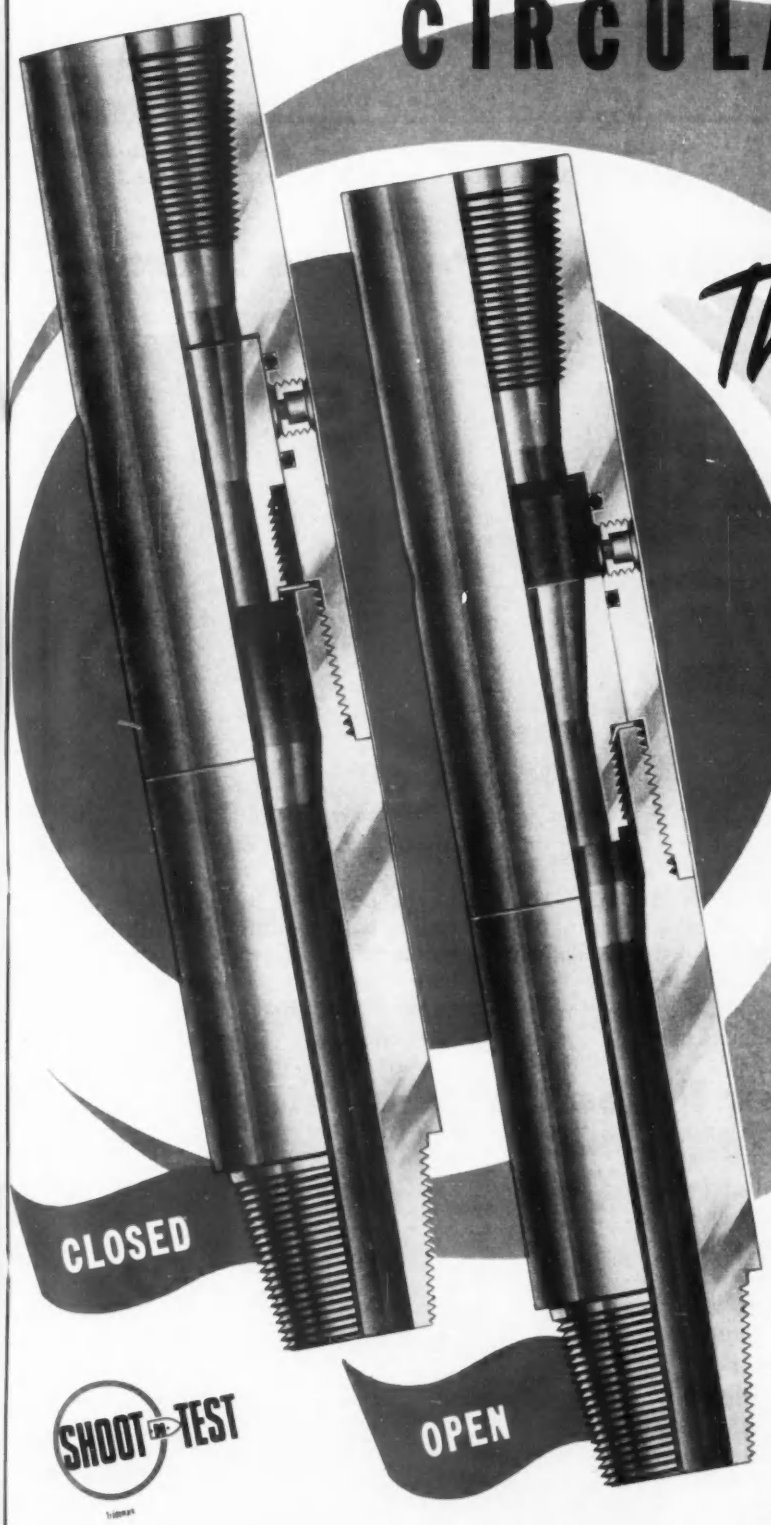

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3. **Minimum obstruction of inside of drill pipe — The Sleeve Type Circulating Valve provides a minimum of 1¾" of opening inside both 4½" and 3½" drill pipe.**
4. **Positive — No manipulation of the pipe required to operate the valve. A special type go-devil is the operating medium.**

For complete details and engineering data write for the Treatise entitled "Reverse Circulation in Drill Stem Testing."

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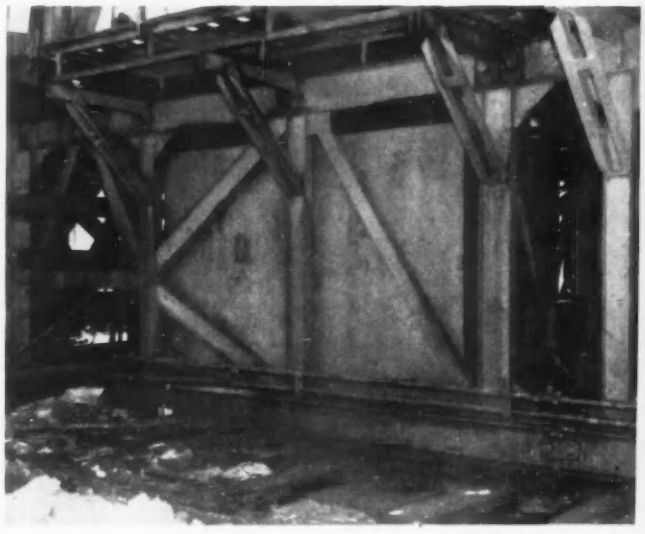
This Hoist Davit Easier to Move

Davits for chain hoists are not new but a safety engineer has designed one which is easily repositioned. This davit support has two bands of steel supporting three radial ball bearings each. The steel bands are concentric circles separated with strap and angle iron for rigidity. The ball bearing units are attached to the steel circles with pins which fit into the openings of the inner races. A thick band of steel attached to the air chamber at the desired spot provides a track for the top three bearings to run on, and also provides vertical support for the davit and chain hoist.

The horizontal boom of the davit is more or less conventional and contains a ring at the outer end for attaching the hook of the chain hoist. To remove a valve chamber cover, the mechanic simply grasps the chain of the hoist and easily brings it above the cover to be removed from the pump.

Boxed Structure Provides Storage

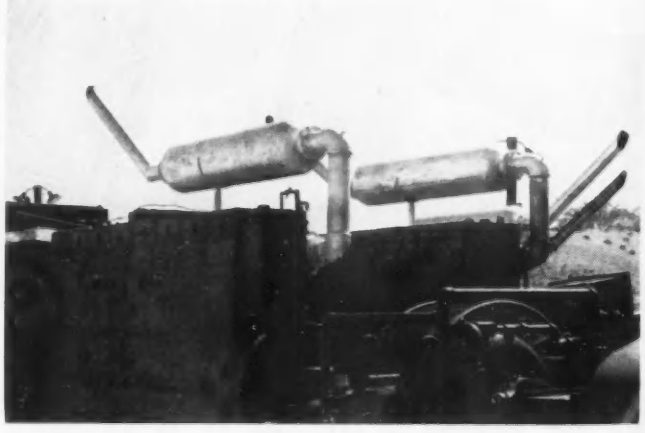


Voids in the engine substructure can serve to house a water tank for the drawworks brake and general rig use. The illustrated unit, built of heavy gauge plate metal, was set up within the substructure without requiring additional bracing across the sides. Of course, several beams were welded in place below the tank to support the heavy load.

Actual installation of the tank will depend upon the design of the substructure. However, in most instances, the tank sides are simply welded to the vertical support post of the substructure.

Inlet and outlet connections are placed conveniently along the sides of the tank and it is desirable to install a baffle within the tank to trap sediment transferred to the tank. A base drain valve should be installed to remove fluid from the tank prior to rig moves.

Muffler Pipes Installed at Angle



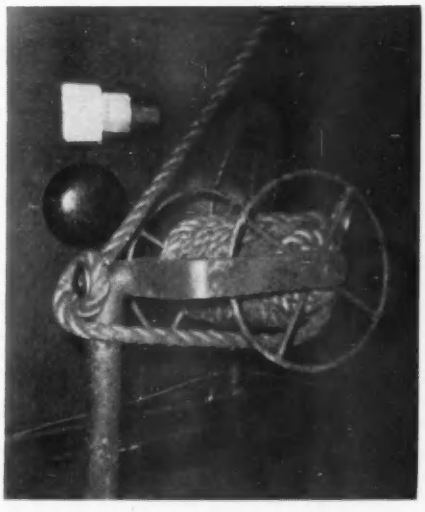
Rigging time is considerably reduced when the mufflers are permanently installed on brackets at the side of mud pump engines. To dissipate the products of combustion into the air, the tail pipes of these mufflers are all set at an angle of approximately 45 degrees and have the outlet mitre-cut. Specific advantages of this arrangement are that all harmful gases are elevated high enough that they do not create a hazard for the crew, and also that the objectionable odor of burned diesel fuel is not noticeable.

Guide Spools Sand Line Smoothly

When the wire line coring unit is stationed away from the rig floor it is a problem to make the sand line spool properly when deep zones are being cored. A simple guide is effective in overcoming this problem. It consists of a finger board welded across two upright pieces of two-inch pipe. The fingers are made of 1 x 6 inch nipples and welded securely to the cross member.

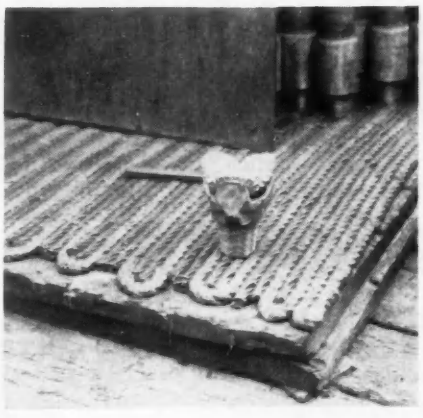
The two-inch risers are hinged at the bottom and held back by short lengths of chain. This allows the board to ride the proper distance from the wire line spool. As more wire line is wound on the drum, the chains can be extended to let the board ride the proper distance from the drum.

In operation, a workman stands in front of the drum with a bar and holds the line a few seconds in each spot along the drum to make it spool properly. He can easily make the line pass back and forth the entire length of the drum by putting the bar on the proper fingers and prying the line over with minimum effort and complete safety.



Coiled Cat Line Is Ready for Use

Cat lines play an important role on all types of rigs and should be kept ready for instant use. Because loose rope presents both housekeeping and safety problems the solution is to coil the rope on a reel such as the one illustrated. Coiled on the reel, the cat line is ready for any necessary lifting jobs, and presents no safety hazard.



Setback Platform Has Non-skid Surface

An excellent surface for set-back platforms can be made of discarded steel drilling line and manila cable. The platform base is made by bolting two floors of common two-inch derrick timbers together. The steel drilling line and manila cable are then laid in alternate rows on the platform. This surface provides adequate drainage of mud which drips from wet stands, and also provides an almost non-skid surface for men clad in wet, muddy boots. Wear of cable and rope has proved negligible on a similar setback which has been in use on three deep hole locations.

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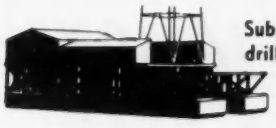
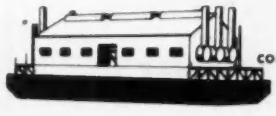


Submersible drilling barges

Tugs



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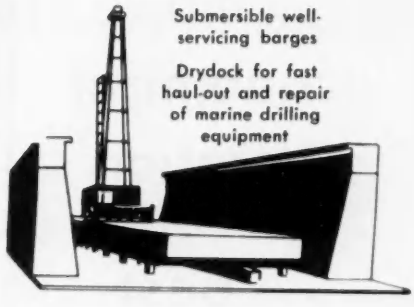

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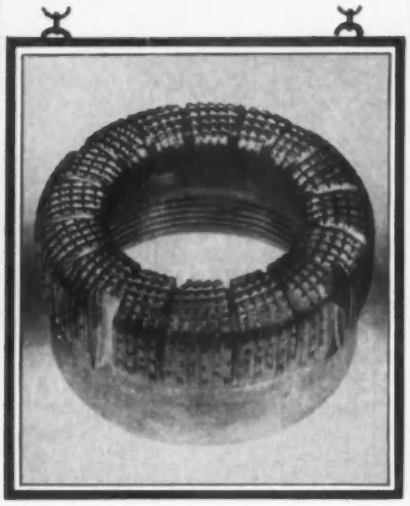

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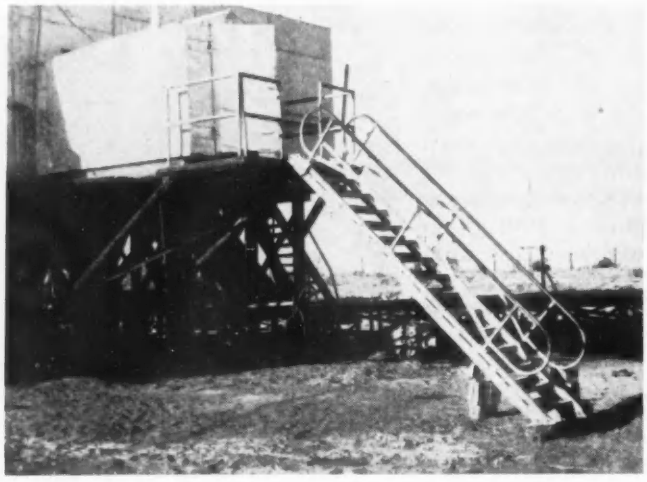
Tool House Support Moves With Rig



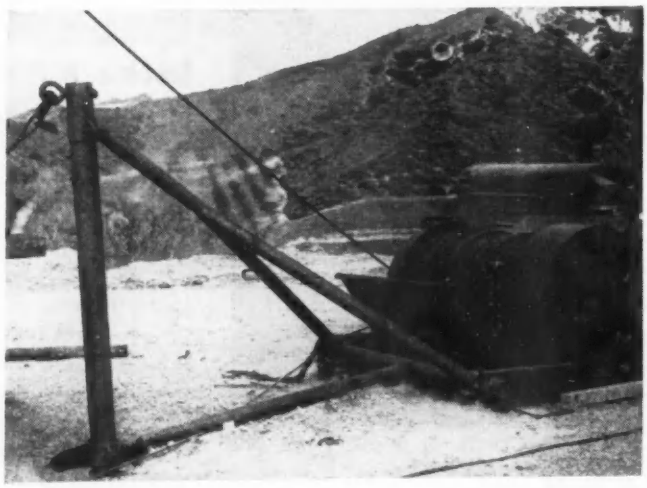
In areas where it is possible to skid the rig from location to location, the illustrated tool house support offers advantage in that it is not necessary to remove the structure when the rig is moved. Simple in construction, yet capable of supporting a heavy load, this pin locking support is convenient in both location use and tearing-down.

The first step in building is to form a frame, larger than the tool house base, of four-inch pipe. Cross members are placed within the frame to support the tool house while an end extension provides an entrance way and a place to anchor the stairs.

Once the frame is completed, two lengths of 3½-inch drill pipe are cut to extend from the tool house frame to the lower substructure sill. Each end of the support is flattened and drilled to fit a similar adapter on the tool house frame. The adapter on the tool house frame and the substructure sill is made of three-quarter-inch plate metal. The frame is latched to the upper structure sill in the same manner.

When the unit is installed, a winch truck lifts the frame to the derrick floor level, pins are secured and the diagonal support is locked in position. Since all support is provided by the diagonals, the unit is void of any equipment touching the ground. Hence, on skid jobs the frame and tool house can be left at derrick floor level.

Tail Post and Sand Reel Combined



The highline tail post instead of being fixed on the outer end of the pipe walk, has been combined with the sand reel to provide a backstop for the reel if tension tends to pull it towards the rig.

This apparatus is an A-frame with the two legs attached to the top bar of the sand reel unit with clips, or collars, to allow for alignment on uneven ground. A horizontal brace is attached to the center of the towbar and the base of the upright highline post. The conventional ring bolt attached to the top of the post provides connection for the highline when rigging up. Clamps at all point of contact between the highline-backstop and the reel unit provide an easy means of disassembling when desired.

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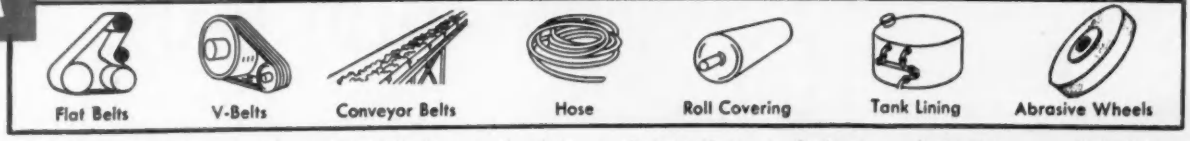

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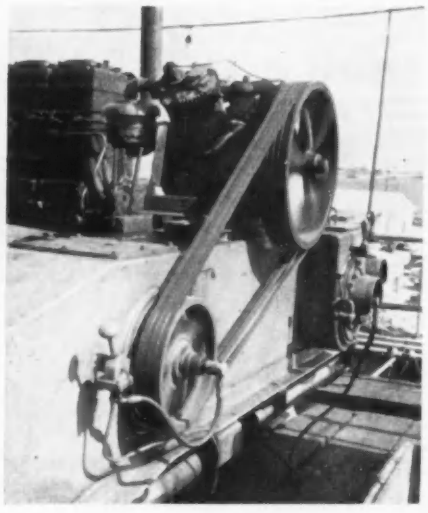

Engine Extension Compresses Air

On large rigs where one of the main power units is continuously running, a power takeoff may be made on the compounding unit as shown.

Two angle irons are welded to the top plate on the compounding unit and slotted to match the holes on the compressor base. This permits the compressor to be shifted back and forth to obtain the best belt tension. Then the compressor is in a convenient place where it can be easily serviced.

The power takeoff is an extension of one of the shafts of the compounding unit and it can be declutched when it is not necessary to run the air compressor. This hookup saves the extra engine normally required to run the air compressor. Even if one of the main power units is down, the compressor can be run through the compounding unit by one of the other engines.

Metal Bumper Is Split Surplus Pipe

Bumper boards in current use in Eastern New Mexico are constructed inexpensively of surplus six-inch pipe which is split in half. The joints should be made in required lengths to extend from the floor of the derrick downward at the desired angle to the end of the pipe walk. Upper ends of the split pipe bumper are welded to a plate designed to rest on the first sill of the substructure. The opposite ends are attached to a double plate with a hinge joining the

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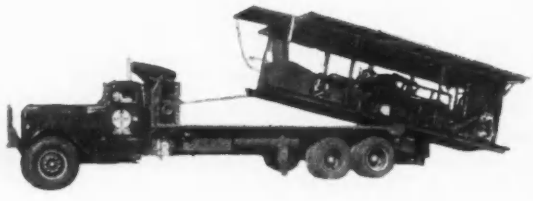

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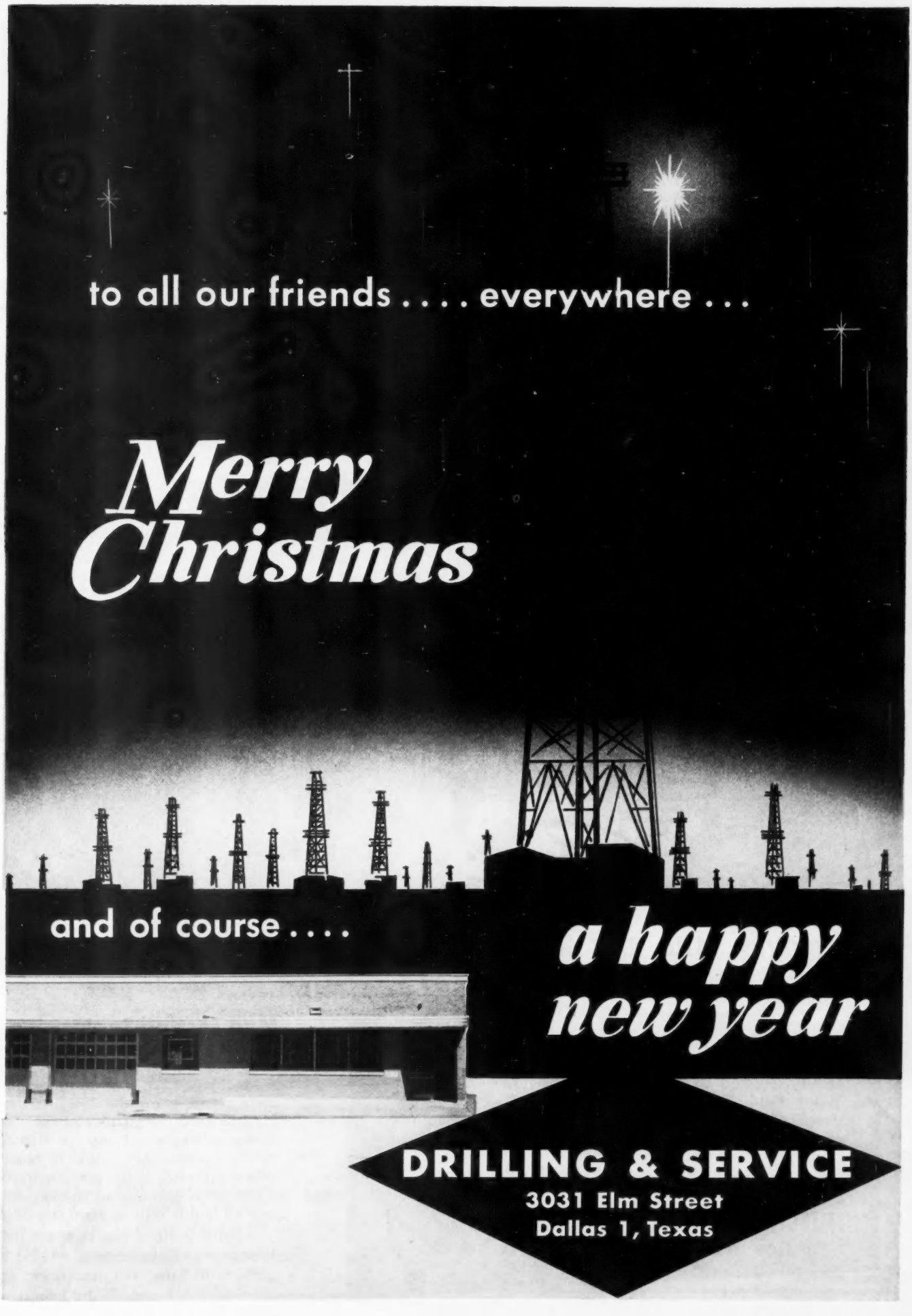
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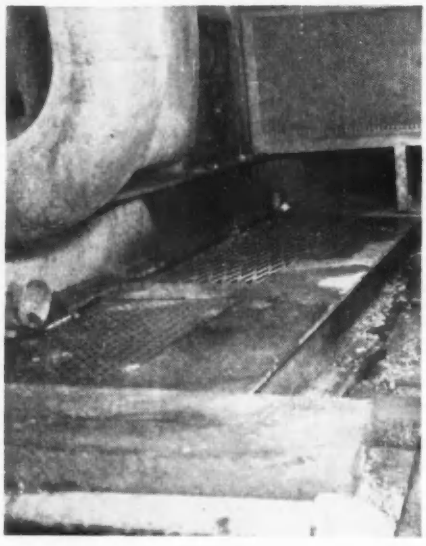
two members. Two mid-section reinforcing plates are welded to the back side of the bumper to keep the individual pieces of split pipe from separating when a joint of pipe is being brought into the derrick.

Base Blocks Keep Pump Base Aligned

To simplify and speed aligning the slush pump on the sub-base during rigging-up operations, one company welds to the sub-base several small steel blocks at points along the length of the pump base.

This eliminates much of the barring and skidding that usually is necessary to line up bolt holes properly. The blocks are not any higher than the thickness of the flange portion of the I-beam supporting base, and therefore offer no interference to the normal use of end wrenches in tightening down the bolts. Another function of the blocks is to stop any possible side play, enlargement of the



holes or even the possibility of having a bolt shear off in the course of drilling the well. Side motion induced by pump vibration is limited, and the cost of the blocks is negligible. If necessary, due to the change-over to a different-sized pump or base, they may be burned off in only a few minutes' time.

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Mud Testing Tools Are Stored in Stand

Most rigs have mud testing equipment which is for the most part left lying around the vicinity of the shale shaker. To prevent loss or damage to this equipment it should be housed in a stand such as the one illustrated. Thus it is always at hand when needed and is kept in good condition.

A suitable stand can be made from four pieces of sheet metal welded together to form bottom, back and sides of the stand. Eight lengths of

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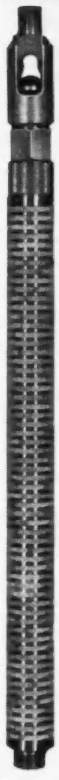

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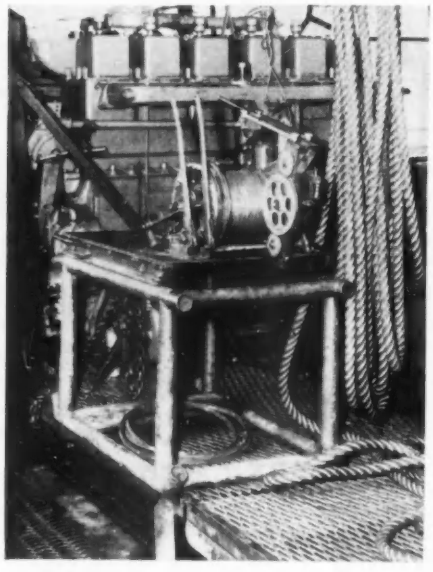
pipe make up the legs and braces, construction of which can be seen in the photo. Four lengths of small pipe at the bottom and four narrow pieces of steel at the top hold the legs in place. The end product is a portable stand especially suited for holding the rig's mud testing equipment.

Pipe Frame Serves As Wire Unit Base

A simple, two-inch pipe frame base will provide adequate and secure support for a heavy duty wire line measuring device. The combined wire line unit and base weight is enough to anchor the complete assembly in one spot during operation.

Sections of two-inch pipe are welded into square forms to make the base and top. It will be noted that parallel base members have been turned up to facilitate skidding. Four welded legs separate the base and top frames.

Sufficient space has been allowed to install an engine behind the wire line measuring device. However, for rig use, the reel operates satisfactorily with a belt drive from the cathead to the spool flange.



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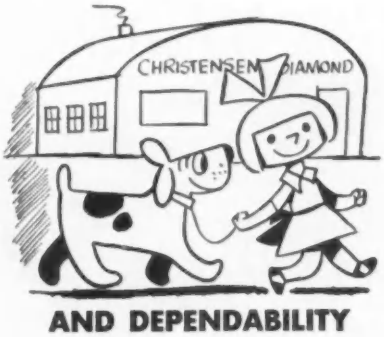

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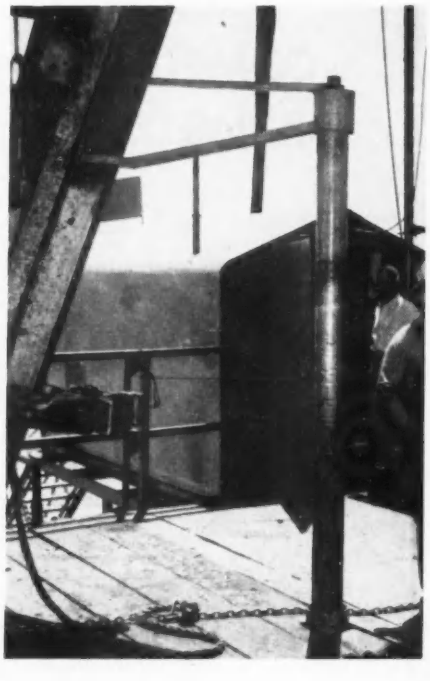

extensions to these plates. The installation is simple to rig up and assures firm anchorage of the guard post.

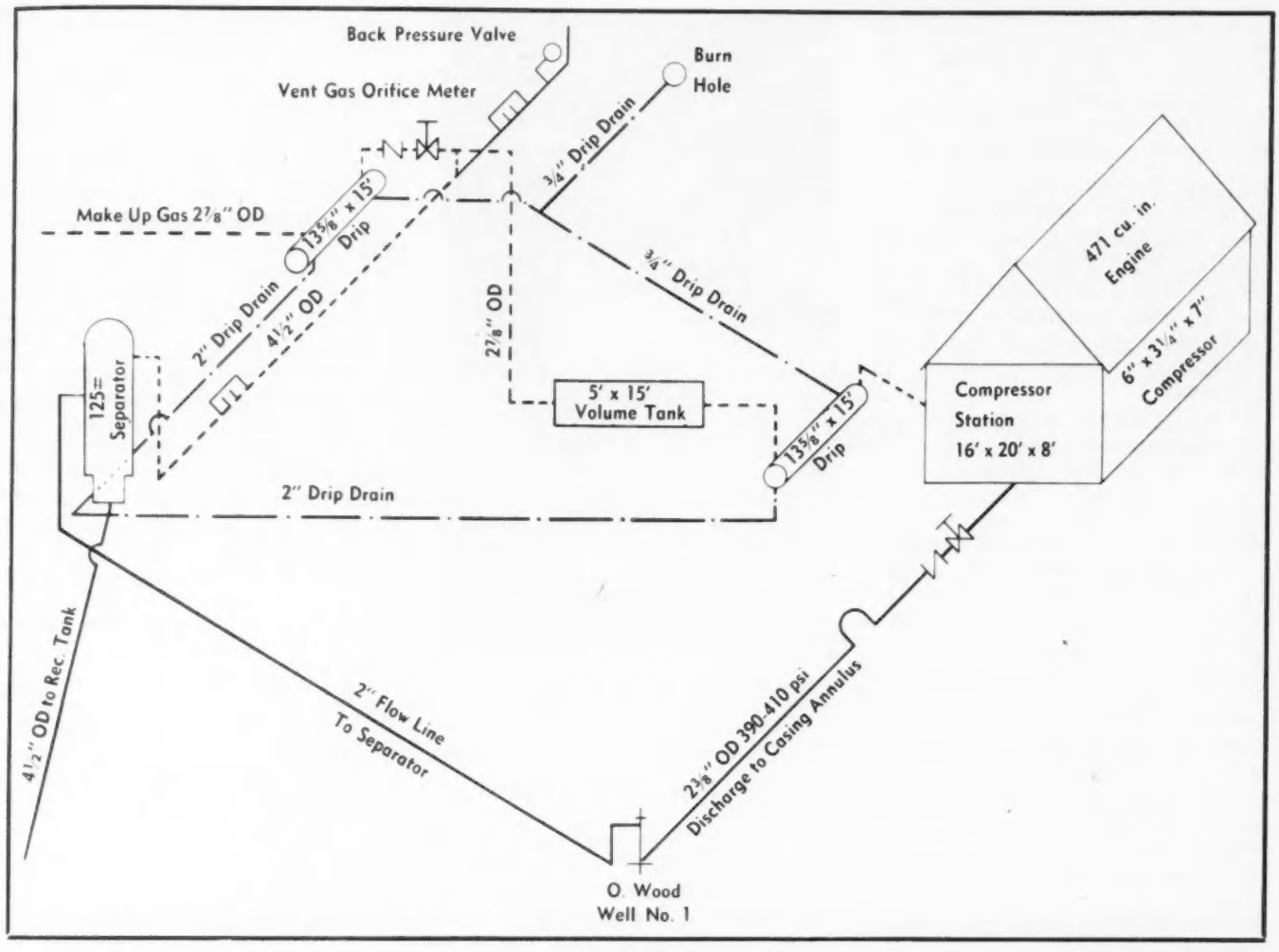
Back Pressure Valve
Vent Gas Orifice Meter
Burn Hole
¾" Drip Drain
Make Up Gas 2⅞" OD
13⅝" x 15' Drip
2" Drip Drain
4½" OD
2⅞" OD
¾" Drip Drain
471 cu. in. Engine
6" x 3¼" x 7" Compressor
Compressor Station 16' x 20' x 8'
125# Separator
5' x 15' Volume Tank
13⅝" x 15' Drip
2" Drip Drain
4½" OD to Rec. Tank
2" Flow Line To Separator
2⅜" OD 390-410 psi Discharge to Casing Annulus
O. Wood Well No. 1

FIGURE 1
Diagrammatic sketch of O. Wood 1 gas lift system.

Rotative Gas Lift a Success in Deep Well

Production costs cut, efficiency high in Oklahoma operation. Good results indicated where adequate supply of makeup gas is available at reasonable rates and in sufficient quantity.

By JAMES F. McDONALD
Assistant District Superintendent, Gulf Oil Corporation, Kiefer, Okla.

ROTATIVE GAS lift has proven an economical means to produce a 9000-foot well in the Newcastle Southeast pool of McClain County, Okla. This installation by Gulf Oil Corporation, reportedly the first of its type in Oklahoma and a model for similar installations throughout the area, was placed in operation on Feb. 4, 1950. The beneficial results indicate this technique to be applicable to production of deep wells where an adequate supply of makeup gas is available at reasonable rates, together with a sufficient quantity of produced gas to maintain constant operation.

Gulf's installation is at its Ollie Wood 1 well in NW SW of Sec. 32-9n-3w, which produced 14,414 gross barrels of oil by flowing, stop-cocking and swabbing from completion on Oct. 16, 1948, to Feb. 4, 1950, when the rotative gas-lift installation was placed in operation. Since then, and up to Oct. 1, 1952, the well had produced 20,401 gross barrels of oil by rotative gas-lift.

The rotative gas-lift system is so named because it recycles its own produced gas within the system. In normally closed gas-lift systems, makeup gas is obtained from a high-pressure gas system, high-pressure gas

wells, utility gas systems, repressure plants, or casinghead gasoline plants. Recycling is accomplished by use of a compressor to increase the gas pressure from separator pressure to that required to operate the flow valves.

History. The Ollie Wood 1 was completed Oct. 16, 1948, at 9006 feet, total depth. Production is entirely from the Bois d'Arc section of the Hunton lime from 8932-82 feet, with the remaining section from 8982-9006 feet being unproductive in the Haragan-Henryhouse member of the limestone.

After acidizing with two 5000-gallon treatments of 15 percent acid the well failed to flow although casing pressure built up to 1100 pounds per square inch gauge after the first acid job. The well was swabbed through 2⅞-inch tubing from Oct. 16 to Dec. 22, 1948, when the tubing was replaced with 2⅜-inch tubing, and nine pressure-operated flow valves installed, spaced on a 0.35 lb/sq. in./ft gradient and set at 400 psig operating pressure. These conditions were adequate to produce the well by its own gas volume and pressure.

Although the well was swabbed until Jan. 18, 1948, casing pressure never reached 400 psig necessary to operate the valves and kick the well off. Swabbing was continued intermittently to March 16, 1949, when it was again acidized with 10,000 gallons of 15 percent acid. This treatment enabled the well to flow, by stop-cocking, until July 22, 1949, but afterwards periodic swabbing was necessary until the rotative gas-lift system was installed.

Rotative System. Compressor size selection was based on available information regarding productivity capacity and gas-oil ratio. Unfortunately, this information was not too reliable because of the erratic flowing characteristics of the well. No flowing bottom-hole pressures were obtained for a year, although several attempts were made to get them. Since the well would flow only after stop-cocking or swabbing, the gas-oil ratio up to the time of the compressor installation was found to be in the order of 477/1. The productivity index was assumed to be in the order of 0.05. Using this index, with the several static bottom-hole pressures that had been obtained, a capacity of 100 barrels per day was indicated. This capacity, with an assumed injection gas ratio of 1000 cubic feet per barrel indicated that a compressor of approximately 200,000 cu. ft/24-hour capacity would operate at 50 percent efficiency if the above assumptions were correct. On this basis a 6 x 3¼ x 7-inch packaged portable compressor was selected.

Safety precautions include "danger" signs inside and out of the buildings.

The unit consists of a two-stage compressor, cooler, intake volume tank and water pump mounted on an H-beam platform.

Compressor: Low stage—6″ x 7″ —max. pressure 180 psig.

High stage—3¼″ x 7″—max. pressure 600 psig.

Engine: 471 cu. in.—multi-cylinder.

Pump: 1″ high-head centrifugal.

Cooling System: Atmospheric gas and compressor water cooler with 21″ fan.

Safety Valves: 1—Trap 40 psig working pressure on inlet scrubber; 1—150 psig explosion-proof liquid level control on inlet scrubbed; 1—pilot control; three pop safety valves set respectively at 656, 175 and 40 psig; 1—Automatic speed control.

Compressor Sheaves: 2—35″ pitch diameter.

Engine Sheave: 1—13″ pitch diameter.

Flow Valves: 9—Pressure operated —set closing pressure 450 psig.

Packer: 7″ O.D. x 2⅜″ with circulating feature.

The compressor unit is housed in a 16′ x 20′ x 8′ engine house as shown in Figure 1.

Safety Features. Safety of operation was one of the foremost objectives in the installation of the compressor and gas supply system. The flow diagram shows that the supply system from the well and the makeup gas system to the compressor intake is adequately protected from the safety viewpoint. The back-pressure valve relieves the complete supply system. Normal back-pressure does not exceed 40 psig except when experimenting to obtain more frequent well flow-heads. In the event the back-pressure should be raised, the safety pop valve on the 125-pound separator is set and tested to relieve at 75 psig. If this valve fails the separator bursting diaphragm of 180 psig bursting pressure would relieve the entire system. Further, the inlet gas scrubber on the compressor is equipped with a safety pop valve which pops at 40 psig. The intermediate safety stage safety pop valve is set to relieve at 175 psig. The safety pop valve on the discharge of the high side of the compressor relieves at 565 psig and is tested to this pressure weekly.

Although liquid content of the gas was only 0.5 gallons per thousand cubic feet, drips and scrubbers were incorporated in the system as a precautionary measure. Both drip-drains are connected into the 4½-inch flow line from the separator to the receiving tank, and the fluid from the drips may be blown into the receiving tank by manual operation of the valves. Supply drips are also equipped with ¾-inch drain lines to a drain pit. To date there has not been sufficient fluid collected in either of these drips to blow to stock. The inlet scrubber, mounted on the compressor-unit frame, is equipped with a fluid trap, liquid-level control, and fluid sight-gauge glass. The trap and control are illustrated. A fluid trap was installed on the compressor intercooler.

Other safety precautions include danger signs inside and outside the building and the engine exhaust has been directed as far as possible from the relief vent shown atop the building.

Flow Diagram. To obtain gas for the compressor after the well has been shut in, makeup gas, ordinarily at 30 psig, is metered through 1500 feet of 2½-inch line pipe to the well vent line, first passing through the drip adjacent to the vent line. It passes through the drip adjacent to the compressor station, then into the compressor intake where it is compressed to approximately 175 psig in the first stage then through a range from 350 to 440 psig, depending on the depth

of the valve in the well from which the well is flowing. As soon as the well starts to flow the makeup gas is shut off and the well is operated by rotation of its own gas.

Installation. Setting and spacing of the valves were determined from the available bottom-hole pressure data and from the static gradient of the fluid in the well which was determined to be approximately 0.35 lb/sq. in./ft depth. However, in order to provide for the possibility of later water production an approximate gradient of 0.4 lb./sq. in./ft. depth was used in spacing the valves. Arrangement of valves when the compressor was first installed is shown diagrammatically. Because of decreasing bottom-hole pressure the top three valves later were removed from the string.

The valves were set at 450 psig closing pressure in order to take advantage of the weight of the annular gas column and to provide surface indication as to the valve in the string from which the well was flowing. From the tubing and casing chart it may be seen that the operating valve opens at approximately 360 psig and closes at 352 psig pressure, indicating the well to be flowing from valve No. 4 or possibly No. 5. As the well continues to produce the annular oil is drawn down by stages until steady operation on one valve is obtained. A series of flowing bottom-hole pressure tests were made covering a 42-day interval in which the decline in pressure was measured. The flowing bottom-hole pressure of 600 to 490 psig confirm the surface recording pressure gauge indication that the well is flowing from valve No. 4 located in the string at 6848 feet.

No major changes have been necessary in the method of operation of the system other than that of the installation of a gas storage tank to retain a portion of the gas that would otherwise be vented to the atmosphere. The tank provides approximately 780 cubic feet of storage at 25 psig. This storage, while still inadequate, benefits the system to the extent that the compressor does not idle as long between well flows, thereby building up casing annular pressure in a shorter time. The flow valves were respaced during December 1951, since the top three valves were unnecessary due to decreased bottom-hole pressure.

Problems. Although this was Gulf's first installation for producing a 9000-foot well, no changes in original plans were necessary to obtain desired operation except the addition of the gas storage tank. Minimum storage space equivalent to that required for one cycle, or flow, should be provided, and although this means additional investment, results are justified. One operator in the area has reportedly overcome the storage problem by utilizing a dry hole, adjacent to the gas-lift operation, as a volume tank.

No mechanical difficulties of consequences have been experienced to date with the equipment. The main repair item has resulted from clutch slippage due to the uneven loading and unloading of the compressor. Since the gas storage tank was installed this trouble has been reduced to the extent that only occasional tightening of the clutch is necessary. In general, the only mechanical problems that might be expected of a system of this type derive from underestimating the size of equipment necessary.

Efficiency. Overall efficiency of the system has been found to approximate

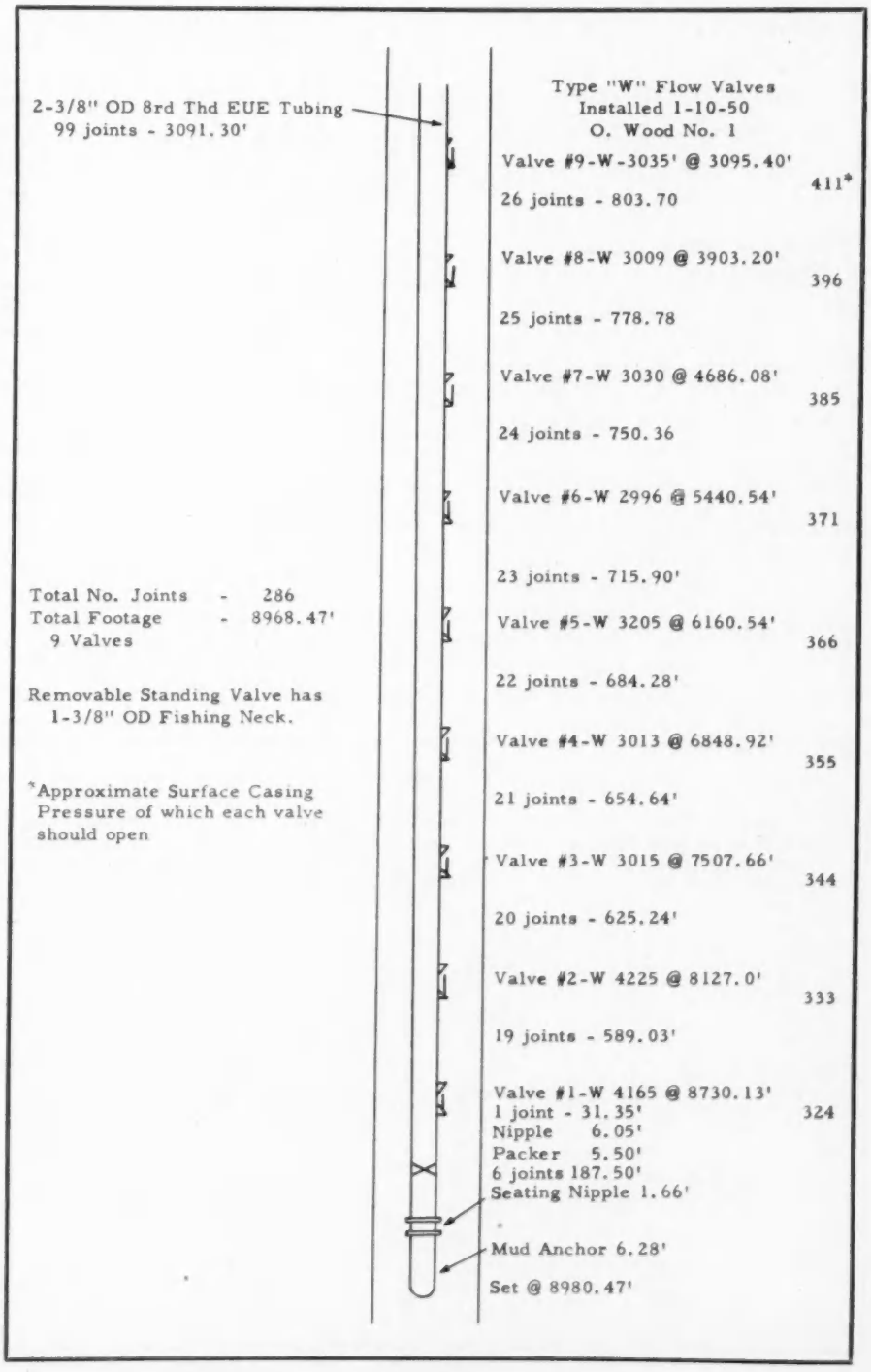

FIGURE 2

50 percent to date. Sample calculations, based on operation during the same period of the bottom-hole pressure tests, reveal the efficiency of the system to be 56.7 percent. Calculations for a closed intermitting system have been used as follows:

Lift	6848′
Cycles, or flows/day	39
Total fluid/day, bbl.	60
Fluid gradient	0.35
Bbl/cycle, or flow	1.54
Tubing size	2⅜″ O.D.
Gas-oil ratio	1639
Pressure exerted by 1.54 bbl. fluid in 2⅜″ O.D. tubing	
1.54 x 258.65	398′
398 x 0.35	139.2 psig
Atmospheres	
$\frac{139.2}{14.4} = 9.67$	
Volume of 6848′ — 2⅜″ tubing	
6848 x 0.02171	148.6 cu. ft.
Volume @ 9.67 atmos.	
9.67 x 148.6	1430 cu. ft.
$\frac{1430}{1.54} =$	928 cu. ft.
Minimum volume to lift 1 bbl. fluid	
Efficiency $= \frac{928}{1639}$	56.7 percent

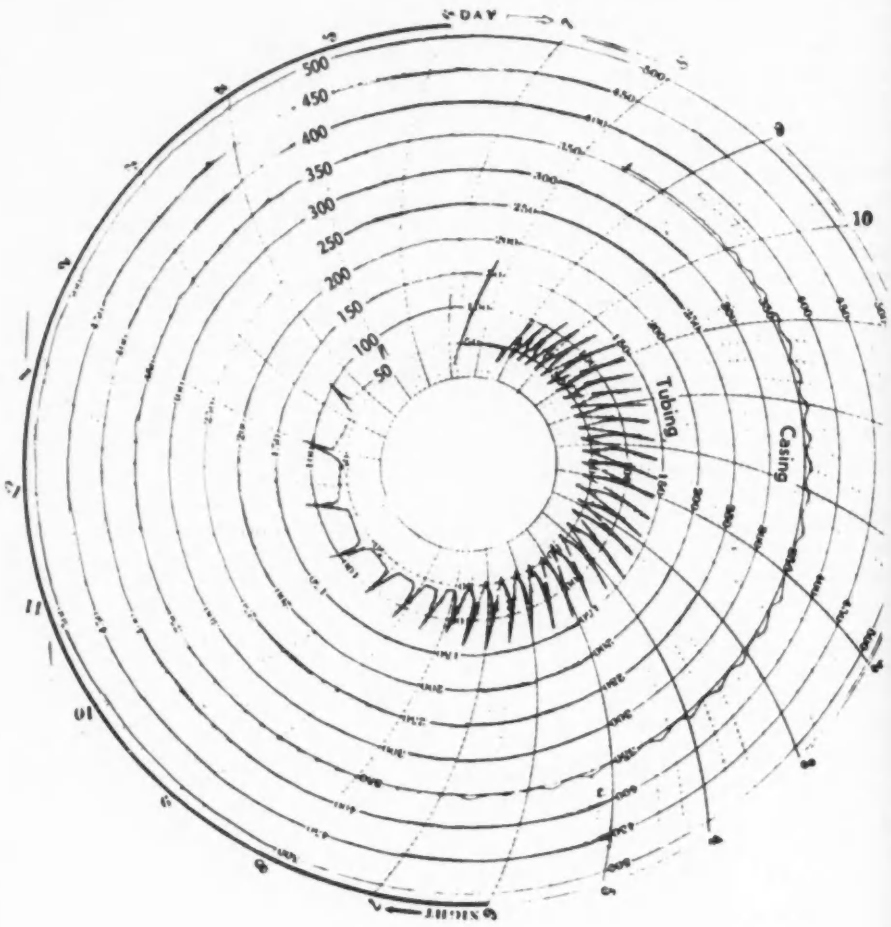

FIGURE 3
Tubing and casing pressure chart of O. Wood 1.

Comparative Costs. A comparison of the estimated installation expenses revealed that conventional pumping equipment was 70 percent higher than rotative gas-lift, and that hydraulic pumping equipment was 67 percent higher than gas-lift. Actual cost of the installation was considerably higher than anticipated due to climatic conditions at the time of installation but was still approximately 35 percent lower than the other two types of equipment considered.

ACKNOWLEDGMENT

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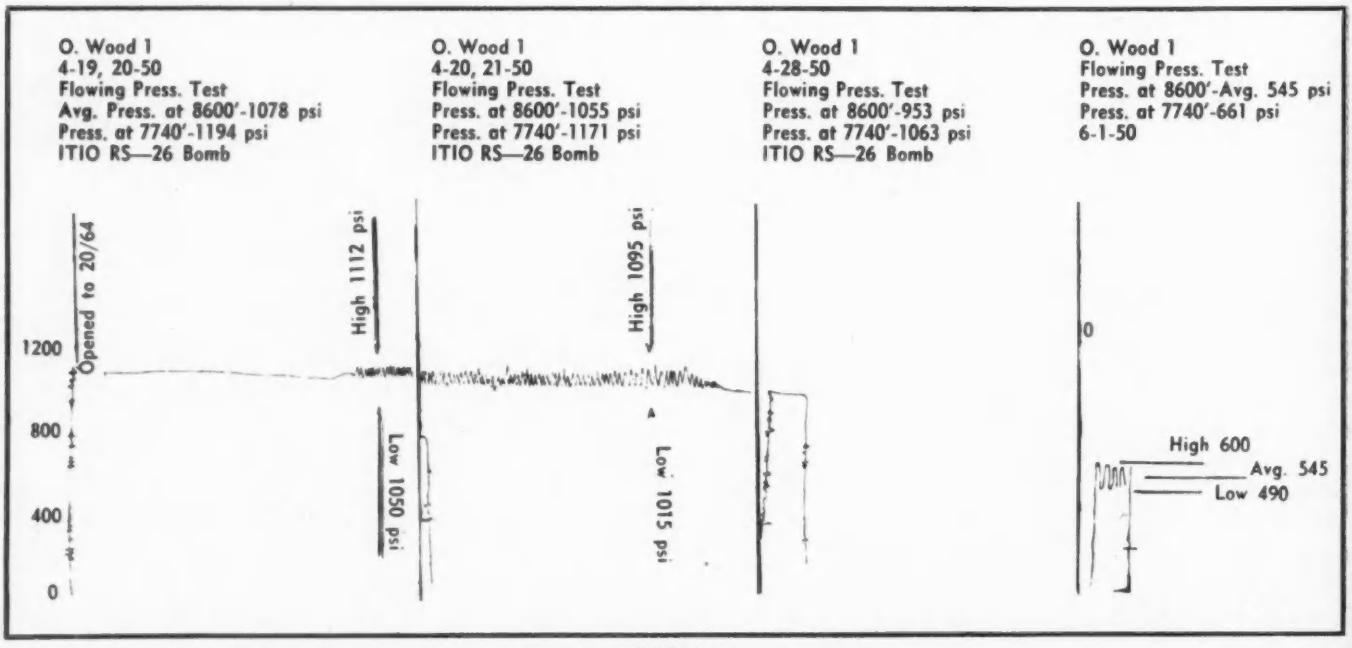

FIGURE 4
Bottom-hole pressure tests made in O. Wood 1.

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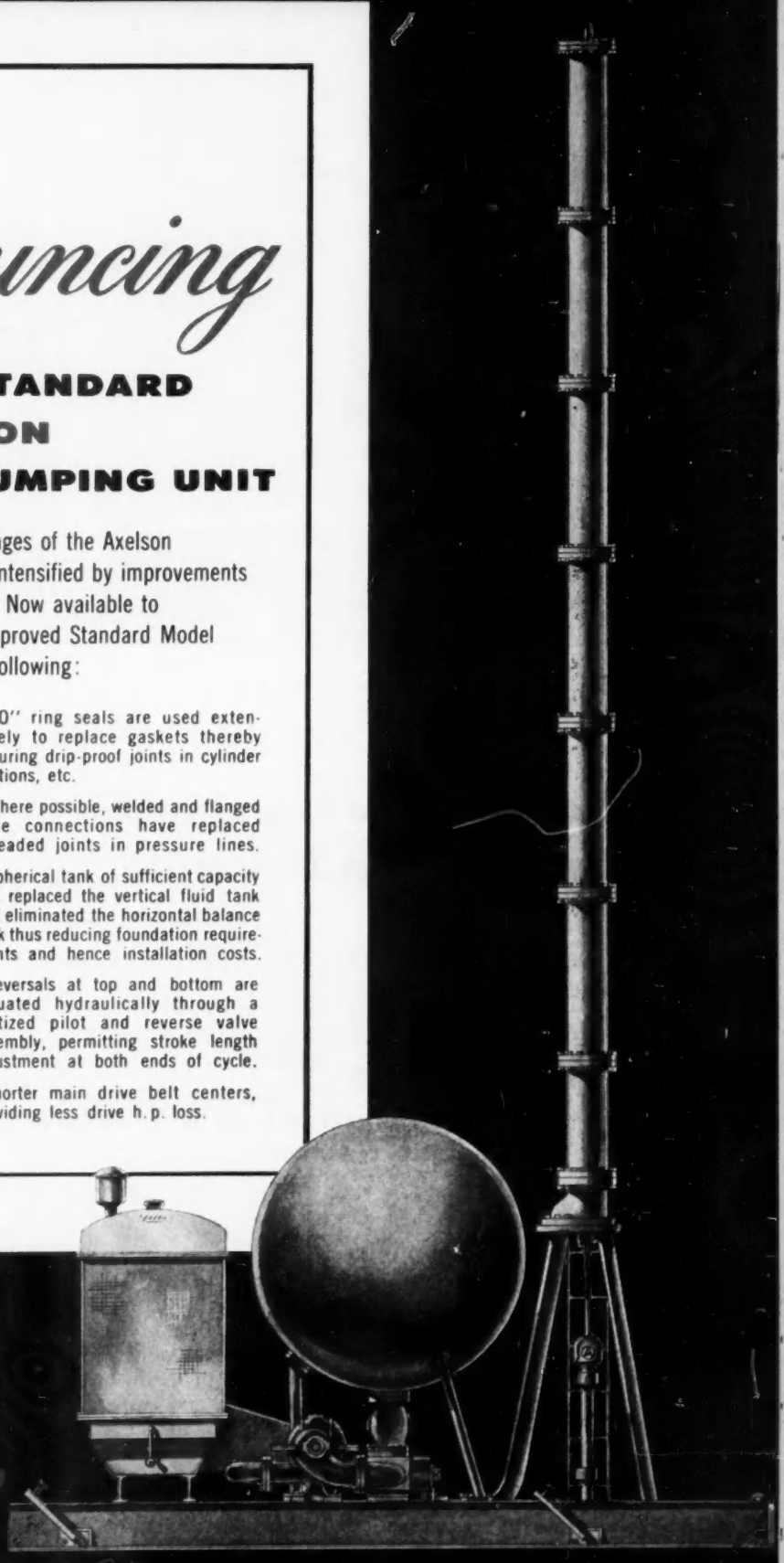

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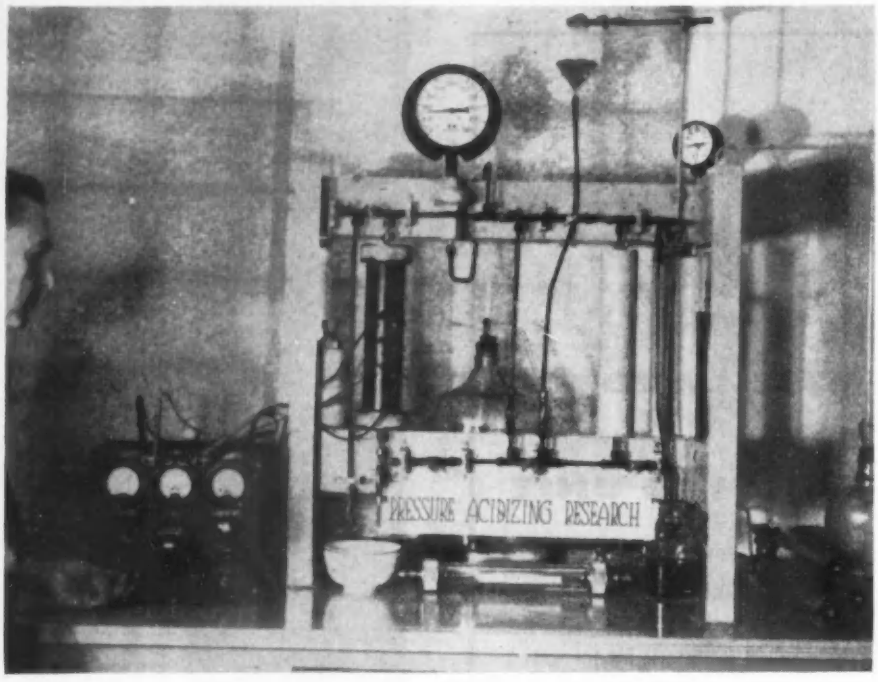


Laboratory pressure acidizing apparatus.

Acid Action Rate Equalized In Limestone and Dolomite

- **New technique prevents emulsification with crude oil.**
- **Insoluble silt residues dispersed to prevent plugging.**
- **Reaction equalized on wide range of carbonate reservoirs.**

By PAUL L. MENAUL
Stanolind Oil and Gas Company, Tulsa

A NEW FORMATION-treating solution called equalized acid has been found to react at about the same rate in limestones as in dolomites. Laboratory tests in a pressure acidizing apparatus have shown the solution to react on dolomitic limestones without leaving the loose dolomite crystals in the spent acid.

The slower rate of acid reaction on limestone allows active acid to increase the permeability in the formation farther from the well bore. The solution is a 15 percent hydrochloric treating acid combined with an admix to slow the reaction with limestones and speed the reaction with dolomites, resulting in a better acidizing job over open sections where both types of carbonate formations exist.

It was first noticed that the new admix in the acid prevented the coagulation of sediment and caused the dispersion and suspension of acid insoluble silt in the spent acid. Dispersed silt in the spent treated acid was found to pass through a coarse filter paper while the silt in spent regular acid quickly forms an impermeable plugging filter cake.

The volume of settled gypsum precipitate was found to be much less in spent treated acid than in the spent regular acid, when these acids were reacted on a gypsiferous limestone. A field trial of the treated acid in a well in the Hugoton field showed that 3000 pounds of silt, dry basis, had been removed with the spent acid, another field trial in the Pine Island showed equalized acid removed 1700 percent more silt than did regular acid.

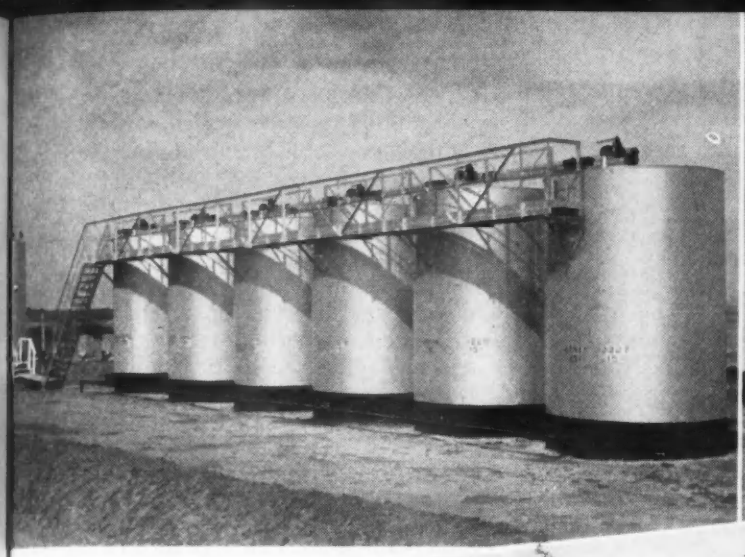
Carbonate Reservoirs. The low initial production of limestone wells is due to a heterogeneous type of porosity, a system of cavities, connected by small capillary channels or fissures. Productive capacity of a well is very sensitive to the permeability of the zone surrounding the well bore. In drilling in limestone the bore hole of the well may encounter only a few pore channels. But the diameter of these channels and interconnecting channels within the formation can be greatly enlarged by acidizing. Acid dissolves the channel walls to enlarge the diameter and allow an increase of fluid production. Volume of an acid treatment varies from 1000 gallons to 10,000 gallons, and tenfold production increases often are obtained by acidizing new wells.

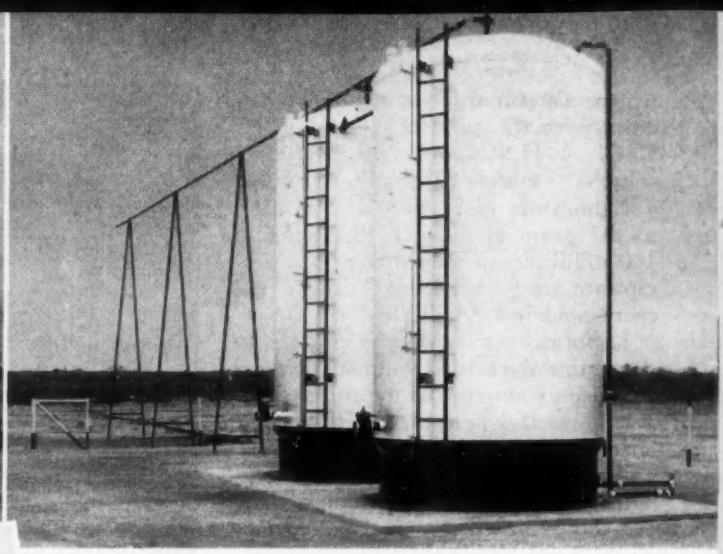
Impurities. Composition of these carbonate formations varies from limestone (calcium carbonate) to dolomite (calcium-magnesium carbonate) and they contain various impurities such as gypsum, silt and other materials which have been found to interfere in oil well acidizing. About 50 percent of the limestone reservoirs can be acidized successfully with diluted hydrochloric acid but because of harmful side reactions caused by impurities in the formation, special chemical additives are required in the acidizing solutions used in the remaining 50 percent of the carbonate reservoirs.

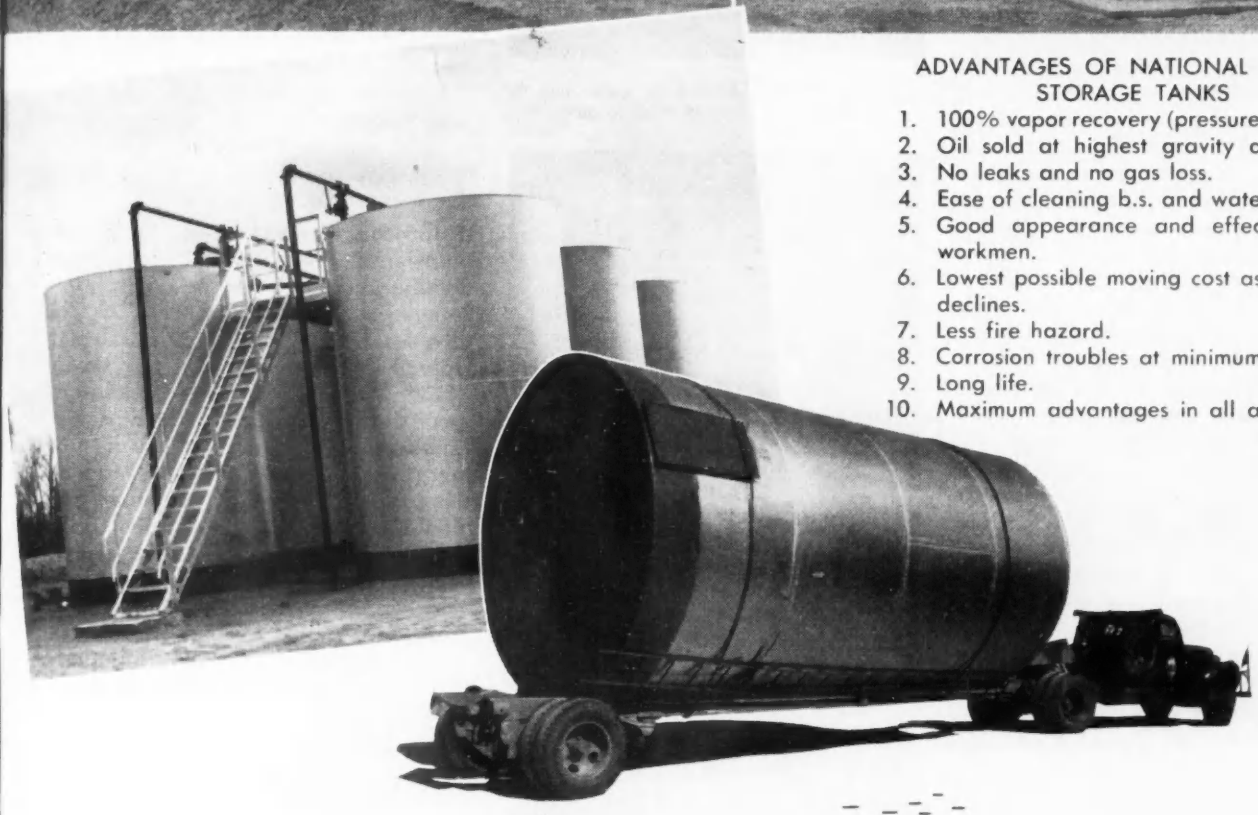
Some of the impurities interfering with good results in oil well acidizing, and for which special chemical additives are required in the treating acid, are: emulsions, gypsum precipitates, silt, mixed limestone and dolomite formations, etc.

Emulsions. The viscous permanent emulsions which form when some crude oils mix with hydrochloric acid has long been recognized as a major problem requiring a specific emulsion preventing admix in the treating acid used in such fields.

Gypsum Precipitate. Gypsum, which is calcium sulfate, occurs in many formations. It is somewhat soluble in treating acid and dissolves while the acid is reacting on the formation. Gypsum is insoluble in spent acid, a solution of calcium chloride. Gypsum may then dissolve while the treating acid is reacting, and precipitate when the acid becomes spent. Also a precipitate of gypsum forms in the spent acid if the treating acid contains sulfuric acid as an impurity,







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by the combination of dissolved calcium with the sulfate:

$CaCl_2 + H_2SO_4 = CaSO_4 + 2\,HCl$
soluble soluble insoluble soluble

Laboratory tests show that as little as .07 gram of gypsum dissolving in 100 milliliters of acid produces a precipitate whose settled volume in the spent acid is 4.0 milliliters.

Laboratory tests were conducted to determine the settled volume occupied by various amount of gypsum, which precipitated when the acid became spent.

Table 1 shows the volume of gypsum precipitate in spent acid after two hours settling caused by various amounts of gypsum.

Permeability. Significance of the gypsum precipitate in spent acid assumed importance when laboratory tests showed a correlation between the volume of gypsum precipitate in the spent acid and the failure of the acidizing solution to increase permeability of limestone cores.

Large cores of limestone, 6 x 5 inches of varying permeability were selected for an investigation of the plugging effect of precipitates and insoluble residues in spent acid. Cores were acidized radially under 1000 pounds per square inch from a ⅜-central hole, with 15 percent hydrochloric acid containing various amounts of sulfuric acid. Permeability of the core was determined before and after acidizing to determine the effect of this impurity on permeability increase.

These tests showed that acid free of gypsum and sulfuric acid increased the permeability of limestone cores having only .5 md to 1.5 md permeability, but that acids containing .05 percent of sulfuric acid did not. Progressively larger percentages of sulfuric acid failed to increase permeability in limestones of greater permeability.

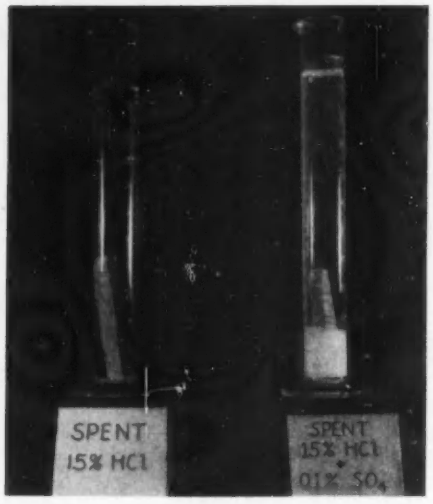
Table 2 shows the laboratory acidizing results of the effect of using acid containing small percentages of sulfuric acid on the permeability increase in limestone.

TABLE 1

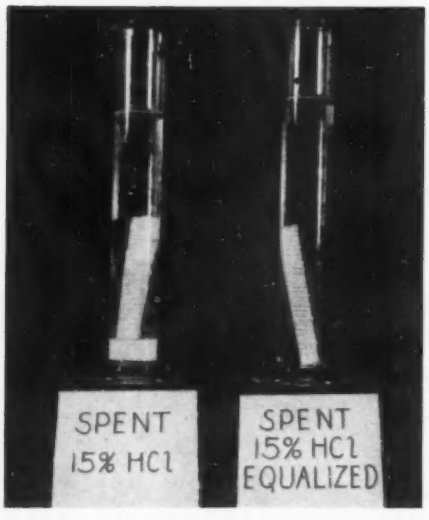
Amount of Gypsum	Settled Volume of Precipitate, Per 100 Ml. Spent Acid
.07 grams	4. ml
.084 grams	6. ml
.14 grams	13. ml
.28 grams	20. ml

TABLE 2

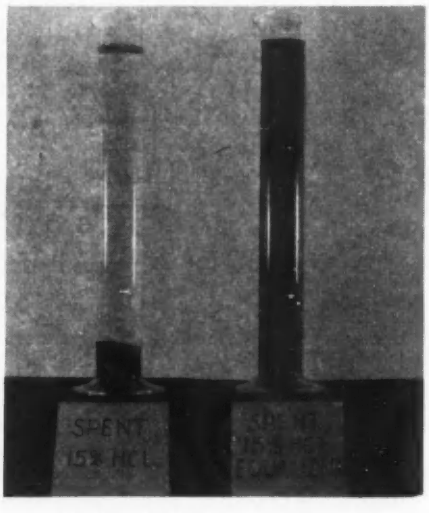
Treating Acid	Permeability in Millidarcys	
	Before Acidizing	After Acidizing
15 Percent HCl	0.5	250
15 Percent HCl+.05 Percent H_2SO_4	1.0	0.5
15 Percent HCl+.05 Percent H_2SO_4	17.0	250
15 Percent HCl+.10 Percent H_2SO_4	10.0	0.5



Gypsum precipitate formed in spent acid by presence of sulfate in treating acid.



Acid reacted on a dolomitic limestone Anton-Irish field, Texas.



Acid insoluble silt, in spent acid.

Plugging Action. It is to be considered, in field operations, that the spearhead of the acid is the first neutralized. It then ceases to be active and any suspended precipitate will plug the channel at a constriction. These laboratory findings explain poor results in some field operations.

Other insoluble materials in spent acid such as the acid insoluble silt can also be detrimental to good results.

Many limestones and dolomites contain an appreciable amount of silt or acid insoluble residue. Silt liberated from the formation by treating acid will quickly agglutinate or settle in spent acid to tiny plugs which will not pass through the smaller capillaries. Laboratory acidizing tests of large cores of Mooringsport limestone, which yields much silt in spent acid, showed poor increases in permeability, similar to the effects obtained with the gypsum precipitates.

It would then be desirable that the acid insoluble residues, silt, gypsum, etc., be kept in a dispersed state and be purged from the formation with the spent acid.

Dolomitic Limestones. A recent publication[1] indicates the widespread distribution of dolomitic limestone formations which have been an unsolved problem in oil well acidizing. Dolomitic limestones is of a type in which dolomite crystals are interspersed in limestone. Acid reacts rapidly and becomes spent on the limestone of these formations and at the same time loosening the small dolomite crystals which dissolve only slowly in acid. This results in a mass of loose dolomite crystals in the spent acid. Field acidizing of some dolomitic limestone formations has resulted in decreasing the production. It is evident that the loosened dolomite particles bridge and plug the acidized channels.

Factors presented here invite further research in the chemistry of oil well acidizing. The rate of the acid reaction on the various limestone and dolomite formations is of first concern, in laboratory research dedicated to the science of oil well acidizing. Performance of the treating acid on the formation must be determined under the temperature and pressure conditions in the reservoir.

Laboratory Tests. A laboratory pressure acidizing appartus was devised and constructed to study the rate of the chemical reaction under controlled conditions of pressure, temperature and ratio of volume of acid to surface area of formation.

To perform these laboratory treating tests acid is introduced into a high-pressure cylinder which is connected to a plastic reacting cylinder 3 inches outside diameter x 1 inch x 14 inches long; with brass end plates sealed with O rings. Wall of the plastic reacting cylinder is penetrated

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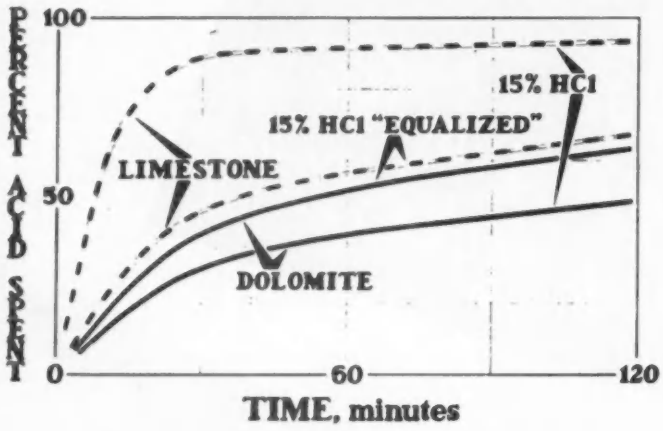
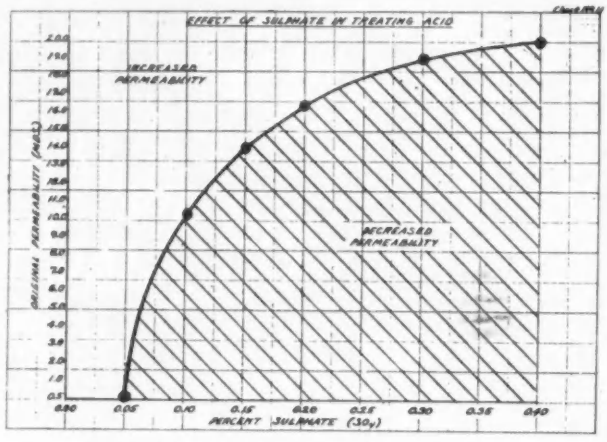


Rate of acid reaction at 1000 pounds pressure and 80° F.



Effect of sulfate in treating acid on permeability.

by four electrodes. For laboratory tests, the ratio of surface area of limestone to volume of acid is controlled by cutting the limestone into sticks, 1 centimeter square by 25 centimeters long, giving 100 sq. cm of surface; these were reacted on by 100 ml of treating acid. The sticks are placed in the plastic reaction cylinder and the ends sealed by brass caps and O rings. The cylinder is pressured with oil to 1000 psi or higher; the oil is then bled off and displaced by a desired volume of acid from the high-pressure cylinder, pressure being maintained.

To study the reaction of acid on limestone, advantage is taken of the property that acids and salt solutions conduct an electric current with a characteristic resistance which varies with each salt and its concentration. For example, spent acid has five times the electrical resistance of hydrochloric acid. Electrical resistance of the treating acid solution is a direct measurement of the amount of acid spent. Determinations are made by impressing a known electric current on the outer electrodes and measuring the current conducted through the reacting acid to the two inner electrodes, then calculating the resistance. During the reaction, the electrical resistance of the solution increases until the acid is spent. The total change of electrical resistance represents 100 percent of the reaction, and any intermediate reading gives the percent of completion at that time. For example, if the total change in electrical resistance is 500 ohms then the change of 250 ohms represents the acid as 50 percent spent.

Laboratory determinations showed that increasing pressures progressively retarded the rate of acid reaction, up to 1000 psi, when free bubbles of carbon dioxide ceased to be liberated, but further increase of pressure from 1000 psi to 4000 psi had no further retarding effect. The comparative rate at which the acid became spent is in inverse ratio to the surface area of the formation to volume of acid and also the temperature. In field acidizing the question of how much surface area of the formation is contacted by the acid, will always remain unanswered, so standard comparative conditions of 100 ml of acid were reacted on 100 sq. cm. of surface in order that all results obtained be on a comparable basis.

Reaction Time. Tests conducted under these controlled conditions, Table 1, show that at reservoir pressures, 100 ml of 15 percent hydrochloric acid reacting on 100 square centimeters of limestone is 50 percent spent in eight minutes but if reacting on dolomite is 50 percent spent in 120 minutes. These data can be interpreted as being comparable to the rate that the acid should be injected into limestones and into dolomites. It also shows that treating acid is quickly spent upon contacting a limestone formation, before it has penetrated far into the reservoir.

Most of the flow channel enlargement occurs near the well bore, continued injection of acid results in forcing non-reative spent acid with accumulated silt and precipitates into unaffected channels. It indicates relatively small volumes of acid and rapid rate of injection should be used in limestone. Dolomites were found to react so slowly, that large volumes of acid and a slow injection rate can be used before the early volumes of acid have become spent. Further tests indicated that the rate of acid reaction on various formations display a wide variation in comparative rate of acid reaction. The rate at which treating acid should be injected into the formation should correspond to the rate at which acid reacts on the formation.

Rate Measurements. The radial depth to which acid dissolves the specific formation, or the rate at which flow channels are enlarged can be determined by these data, obtained with known surface area and volume of acid. It was found that the extent of channel diameter enlargement depends on time of acid contact. Determinations showed that channels in limestone are enlarged by acid at the rate of .032 inch in diameter in eight minutes and in dolomite at the rate of .032 inch in 120 minutes. This is the actual enlargement of the channel diameter, regardless of the original diameter.

In limestone a permeability increase is obtained in eight minutes which in dolomite requires 120 minutes; this also tends to prove that the acid enlargement of the well bore is negligible. In field acidizing, the rate of acid reaction, the rate at which the acid is injected into the formation and the volume of acid used determines where the greatest channel enlargement will be produced. A rapid rate of acid reaction and slow injection will produce greatest channel enlargement near the well bore, while a slow acid reaction rate and rapid injection increases permeability farther from the well bore.

Admixes. Effect of admixes in treating acid were carefully followed in the pressure acidizing apparatus. Addition of 0.6 percent or 2.5 percent hydrofluoric acid retarded the rate of acid reaction on dolomite. The properties imparted by the addition of various surface active agents, corrosion inhibitors, etc. were investigated. A singular chemical admix was found to impart many desirable properties to 15 percent hydrochloric acid and was given extensive laboratory evaluation. The new treating acid was referred to as an equalized acid.

REFERENCES

[1]Origin and Nature of Limestone Porosity, R. B. Hohlt, Colorado School of Mines, Vol. 43, No. 4.

ACKNOWLEDGMENT

The author expresses his appreciation to Stanolind Oil and Gas Company for permission to prepare and present this paper.

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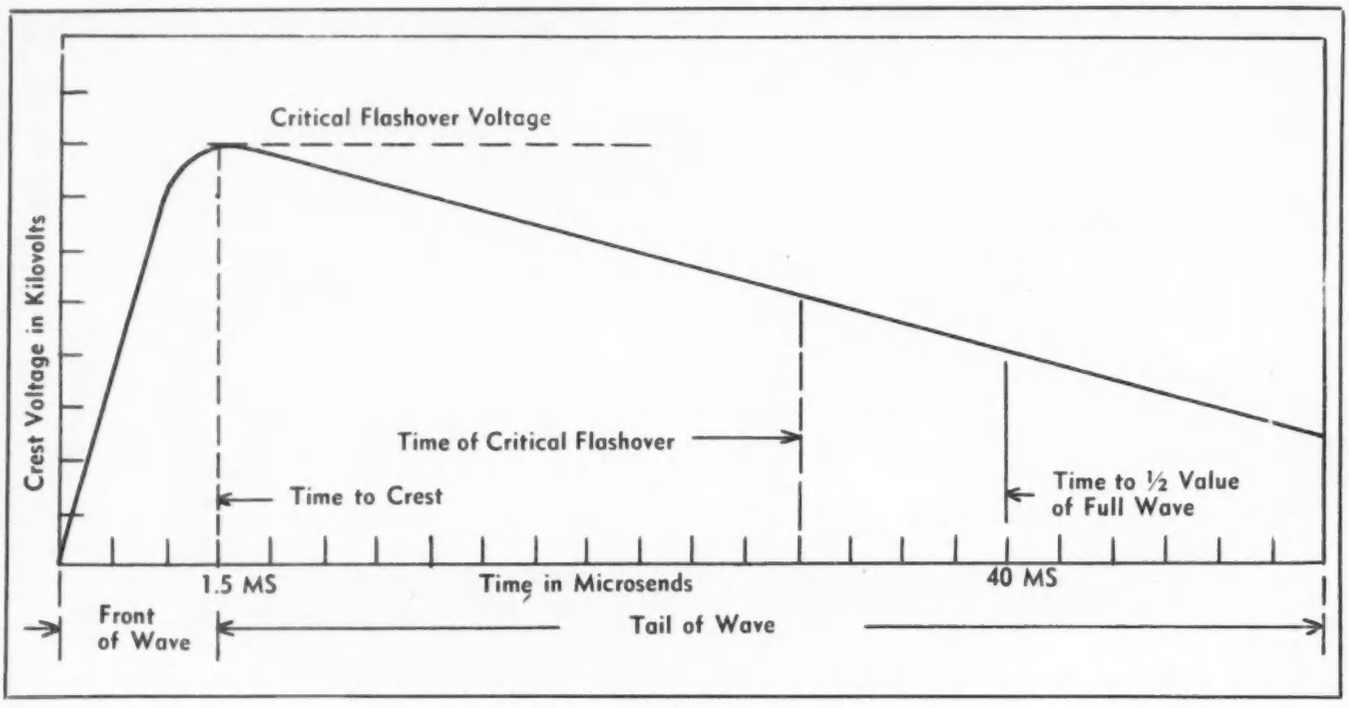

FIGURE 1
Typical impulse voltage test wave of 1½ x 40 microseconds shape. Similar waves occur on distribution system due to lightning.

Don't Let Lightning Strike Twice

Induced voltages are tremendous, but when understood can be dissipated without damage to the electrified pumping well.

By J. N. POORE
Petroleum Industry Specialist, General Electric Company, Dallas

IF YOU'VE HAD an electric motor on a pumping unit or a transformer in a distribution line to burn out without any apparent reason, you'd better investigate the effects of lightning. Induced voltage surges are tremendous and when understood can be dissipated without damage to electrical equipment.

Direct lightning strikes occasionally occur on electrical transmission or distribution lines, and field investigations have shown one to two strikes per mile per year on some lines. The more common occurrence of lightning effects on distribution lines is due to an induced lightning voltage on the line and resulting impulse voltage waves.

An induced lightning surge may occur on exposed power lines by electrostatic induction caused by the collapse of the electrostatic field between cloud and ground.

Both direct strikes and induced lightning voltages on power lines result in waves of voltage and current travelling along the conductors. These travelling waves have a wave front and a length or duration related to that of the cloud discharge causing them. Figure 1 shows the approximate shape of the travelling wave, indicating both the magnitude and steepness of the wave front.

Velocity of these travelling waves is approximately 1000 feet per microsecond on an overhead line; 600 feet in cables and about 300 feet in buried conductor.

Magnitude of the travelling wave depends upon the impedance per unit length of the circuit traversed. This "surge" impedance is about 500 ohms for overhead lines, 20 to 60 ohms for cable, 100 to 150 ohms for buried conductor, 200 to 1600 ohms for rotating machine windings, and is of the order of 5000 ohms for a transformer.

Lightning waves on overhead lines diminish with travel, the degree being dependent upon polarity and wave shape. Attenuation is proportional to the square of the wave voltage. In general, a 2000 kilovolt wave will diminish to half value in three miles of travel, a 1000 kilovolt wave, in six miles.

If a travelling wave encounters a change in surge impedance such as the dead end of a distribution line, a transformer, or a motor, or anything that might change the impedance of the line, it undergoes reflection which may increase the voltage and decrease the current or vice versa.

Effect on Electrical Equipment

As the travelling wave moves along an oil field distribution line, it eventually comes either to a transformer

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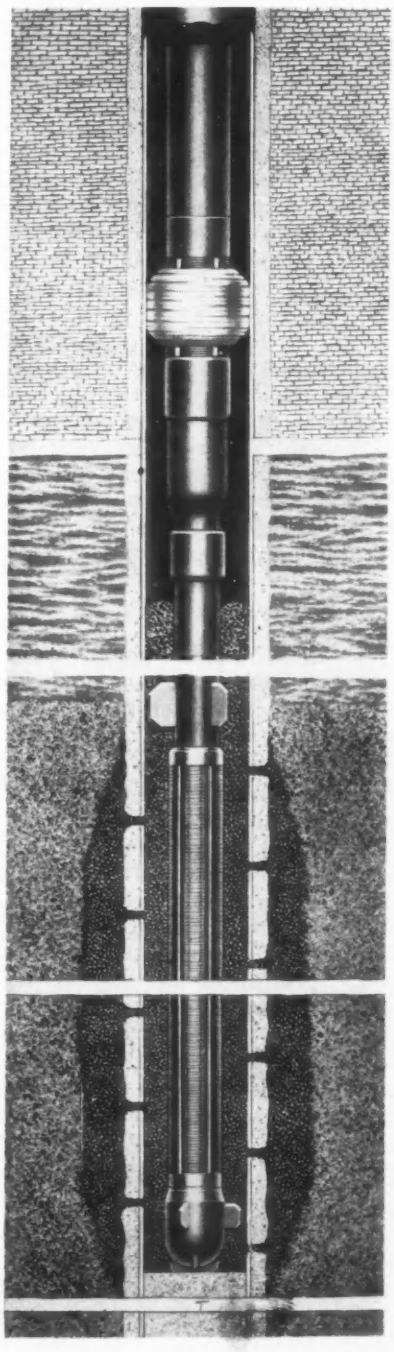

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bank or to a motor starter or a motor connected to this line. If there is no means of lightning protection ahead of this electrical equipment, considerable damage occurs through tremendous overvoltage stresses.

The travelling wave, with its inherent energy, is looking for the path of least resistance to ground. Any weak insulation point on the distribution line such as a cracked line insulator, or a weak insulation point in the connected equipment provides such a low resistance path.

Voltage waves stress the insulation existing between a wire and ground in a motor or transformer or even in a contactor coil. If the magnitude of this voltage is high enough, the insulation is broken down. In addition to the magnitude of the voltage wave, concern must be taken for the steepness of the wave front since this determines the stress that is placed on the turn-to-turn insulation, for example, in a motor. Therefore, two factors of a lightning wave must be considered; namely, the magnitude of the voltage wave and the steepness of the wave front.

Can Melt Coils

If a relatively high voltage wave strikes an unprotected piece of electrical apparatus and causes the insulation to break down, the subsequent low resistance path to ground allows a very heavy lightning current to flow. This high lightning current plus an accompanying 60-cycle follow-through current tends to cause the tremendous burning and heating of the metal such as copper wire, resulting in a melting of the coils either in a transformer or a motor or in a contactor coil.

The 60-cycle follow-through current is that current which flows due to the normal 60-cycle transmission or distribution voltage that exists on the line.

If an adequately low resistance path to ground for the travelling voltage wave is introduced ahead of the electrical apparatus, the voltage wave can go to ground through this external path and the subsequent lightning current and 60-cycle follow-through current can be bled off harmlessly. The protective device known as a lightning arrester provides such a low resistance path if it is properly applied to the distribution system.

The Lightning Arrester

The lightning arrester is a device which has the property of reducing the voltage of an impulse applied to its terminal. It is capable of interrupting any system power current (follow-through) which may flow through the arrester immediately following the lightning discharge, and after the discharge it restores itself to its original condition. The arrester usually consists of a gap arrangement in series with a valve element which has the property of decreasing its resistance exponentially as the current through it increases. This valve element having non-linear resistance and associated gap device are usually assembled in a suitable porcelain housing. The gap device serves the purpose of keeping the valve element substantially disconnected from the alternating current power circuit, except when high potentials appear, having a magnitude sufficient to cause the gap device to spark over, thus allowing the lightning current to flow to ground. The voltage at which the arrester begins to discharge is commonly referred to as the spark-over voltage of the lightning arrester.

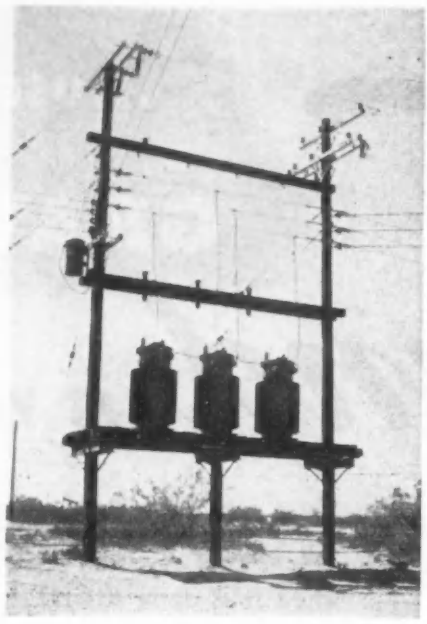

FIGURE 2
Primary distribution arresters shown mounted on cross arm above transformer bank in oil field installation.

FIGURE 3
Secondary distribution lightning arresters shown at top of well pole at oil well pumping unit.

Since the normal distribution system current must not continue to flow through the arrester following a lightning discharge, the arrester must interrupt the flow of such system follow current. This is accomplished by the combined action of the gap and valve element so that at normal system potential the valve limits the power follow current to a value which can be easily interrupted by the gap.

During discharge the arrester must permit lightning currents of 20,000 amperes or more to flow and provide low voltage drops so that protection is afforded to associated apparatus with an adequate margin of safety. This is accomplished by the non-linear resistance property of the value element which may decrease its resistance so that each time the applied voltage is doubled, the current flow increases in litharge-coated pellets of lead peroxide. This latter type has resulted in highly efficient distribution type arresters commonly used on the primary side of the transformer bank for lightning protection.

Valve-Type Arresters

Such arresters are commonly called "valve-type" because of the similarity of the action of the non-linear resistance to the relief action of the safety valve on a steam boiler.

Valve-type arresters, of the distribution class are used on the primary transmission line and are commonly placed ahead of the transformer bank. Because of the long secondary distribution lines in oil field pumping installations, it becomes necessary to provide protection for the oil well pumping motors and control from lightning surges which can occur on these relatively long and exposed secondary distribution lines. Two types of low voltage, 650-volt lightning arresters, both having excellent valve action, are available for this type of protection. One is the pellet arrester similar to the higher voltage ones used on primary circuits and the other is the thyrite arrester such as used in most oil well pumping controls.

Primary lightning arresters are

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mainly for protecting transformers against failure of insulation between conductors and between conductors and those parts connected to ground. However, on the secondary distribution lines, the lightning arresters must protect motors and controls. This constitutes a special problem because of the relatively low dielectric strength of the windings on a motor or a control compared with transformers of the same voltage rating. To reduce the electrical stresses between adjacent turns of conductors, it is necessary to reduce the rate-of-rise of applied voltage, or the steepness of the voltage wave front, which is accomplished by using protective capacitors connected from line to ground close to the motor terminals. The major insulation between conductors and ground is protected by a lightning arrester which is connected in parallel with the protective capacitor.

Figure 2 indicates how primary distribution arresters are used to protect transformer banks. Notice how close the primary arresters are connected to the incoming line terminals of the transformers.

Figure 3 shows how secondary arresters are used to protect the control and pumping motors. Here, a single pole 0-650 volt pellet arrester is mounted on the pole closely adjacent to each phase-wire at the three-phase circuit.

Figure 4 shows a cutaway view of the conventional distribution type lightning arrester, such as would be used ahead of a transformer bank.

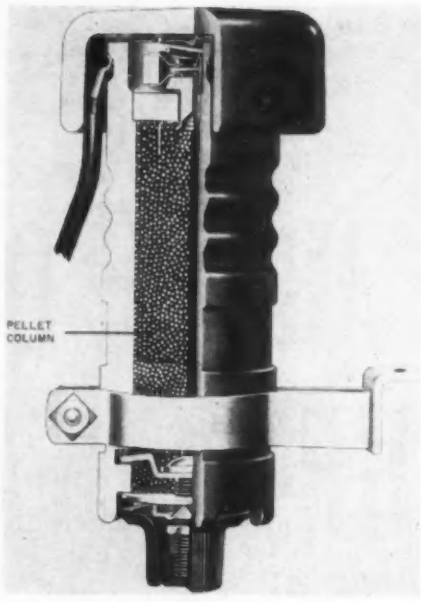


FIGURE 4
Cutaway of conventional pellet-type lightning arrester used for primary lightning protection.

Location of Arresters

Lightning arresters should be located in reasonably close shunt relationship to the apparatus to be protected because of the lightning wave front and the resultant voltage gradient over relatively short lengths of conductor. Normal practice locates the primary distribution arrester on the cross arms with the transformers.

On most standard oil well pumping controls, a secondary arrester is mounted in the starter enclosure and consequently is connected in very close relationship with the control equipment.

The most common problem is that of locating the lightning arrester close enough to the motor terminals to provide adequate protection. Mounting pellet type secondary arresters at the top of the entrance pole or utilizing the secondary arrester mounted in the control panel may not provide adequate protection for the motor. Reason is that in many instances the entrance pole and the control panel are located considerably farther than 25 feet or more from the motor terminals. Better protection would be provided if the secondary arresters at the top of the entrance pole were relocated at the motor terminals. If protective capacitors are used to reduce the possibility of turn-to-turn insulation breakdown on the motor, they should also be connected at the motor terminals.

The lightning arrester, and protective capacitor (if used), must be connected in shunt relation to the motor. It is also imperative that the ground connection from the arrester, the capacitor, and the motor frame are connected to the same common ground. This insures that the voltage applied across the motor during lightning discharge is only the voltage across the arrester and does not consist of combined voltage drops of the arrester, the ground wire and the ground resistance. This is very important and should be strictly practical in applying protection.

Figure 5 shows how these various ground connections should be tied to a common point to insure that minimum voltage is applied across the motor during lightning discharge. The motor starter and starter enclosure grounds should also be interconnected to the arrester ground, resulting in a common ground at the motor location.

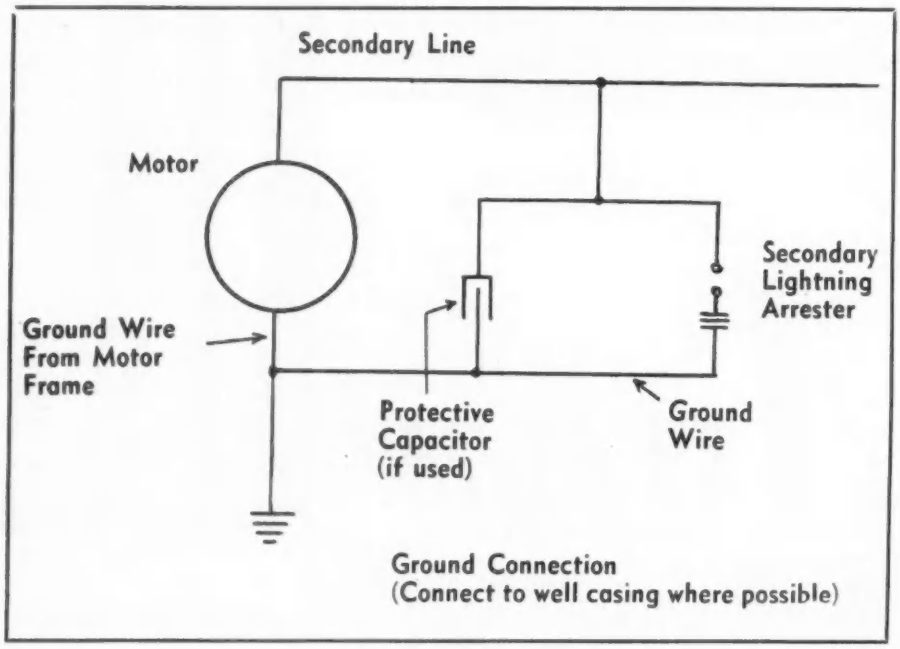


FIGURE 5
Recommended method of connecting ground wires from lightning protective equipment and motor frame in shunt relation.

Adequate Grounds

Although close shunt relationship between lightning arrester and motor frame protects motor insulation, a low ground resistance is essential if frame potential is to be kept low with respect to ground.

A good ground connection is one which provides the lowest electrical resistance to the bow of current. For adequate protection, the resistance of the ground connection should be as

near zero as practicable but preferably not over five ohms.

Ground resistance can be measured by means of small portable instruments. It is good practice to systematically check the ground resistance at definite intervals to make sure it remains low enough to provide adequate protection.

The most common ground connection used in oil fields is the ground rod. This is a galvanized steel rod some five-eighths inches in diameter available in 8- or 10-foot lengths. It is driven in the earth to its full length and the grounding wire from the protective equipment is solidly connected to it.

Low ground resistance depends upon the moisture content of the earth and the chemical contents of the earth. Certain areas of the Southwest are very dry and the water table in these areas is frequently several hundred feet below the ground surface. Obviously an 8- to 10-foot ground rod does not reach deep enough to penetrate earth containing much moisture content. In these areas adequate low resistance ground connections are difficult if not impossible to obtain.

A ready-made, and ideal ground connection exists at oil wells. This is the well casing. The well casing extends for a considerable distance down in the ground and passes through one or more water bearing sands thus providing a good low resistance ground connection. Many operators in the West Texas and Texas Panhandle areas use the well casing as a ground connection with excellent results. To date, no reports have been made of any electrolytic action or corrosion due to using the well casing as an electrical ground.

Solid Connections

Ground wires from the secondary lightning arresters, the motor frame and the motor starter enclosure should all be solidly connected to the well casing. Many operators weld a stud to the casing for this common ground connection.

In the case of transformer banks located some distance away from a well, it is not possible to ground to the well casing. Other means of securing an adequate ground connection must be used. If a single ground rod does not give a good low resistance ground, two or more rods, spaced some six feet apart must be paralleled until the resistance of the multiple rods reaches the desired value.

Figure 6 illustrates a recommended method for connections in the primary transmission line, including the primary lightning arresters, fuse cutouts and transformer bank to the secondary distribution line, motor starter and motor for a typical oil well pumping installation.

It should be noted in Figure 6 that the primary lightning arresters are connected ahead of the fuse cutouts. This is recommended to reduce the blowing of primary fuses due to lightning surges. Additional reduction in primary fuse blowing can be obtained through the use of high-surge fuse links instead of the conventional fuse links in the primary fuse cutouts. Use of high surge fuse links in no way detracts from the short circuit or over-current protection of the transformer bank. High surge fuse links are available for protecting transformer banks up to and including 75 kilovolt-amperes capacity where the primary voltage is 13,200 delta connected or 7200/12,740 volts wye connected.

Lightning surges on a primary transmission line frequently cause "single-phasing" to occur when only one primary fuse blows. This primary "single-phasing" often causes single phase failures of the three phase oil well pumping motors, particularly when the motors are lightly loaded and continue to operate on single-phase voltage instead of stalling and forcing the overload relay in the motor starter to trip. This difficulty can be considerably minimized if proper attention is paid to adequate lightning protection on the primary and secondary distribution lines and at the motor itself. Altogether, efficient arresters (and capacitors) properly located, and effectively grounded by complete interconnection to apparatus frames and to well casing; plus possible improved primary fusing, will add up to a greater degree of satisfaction with the electrified oil well pumping installation.

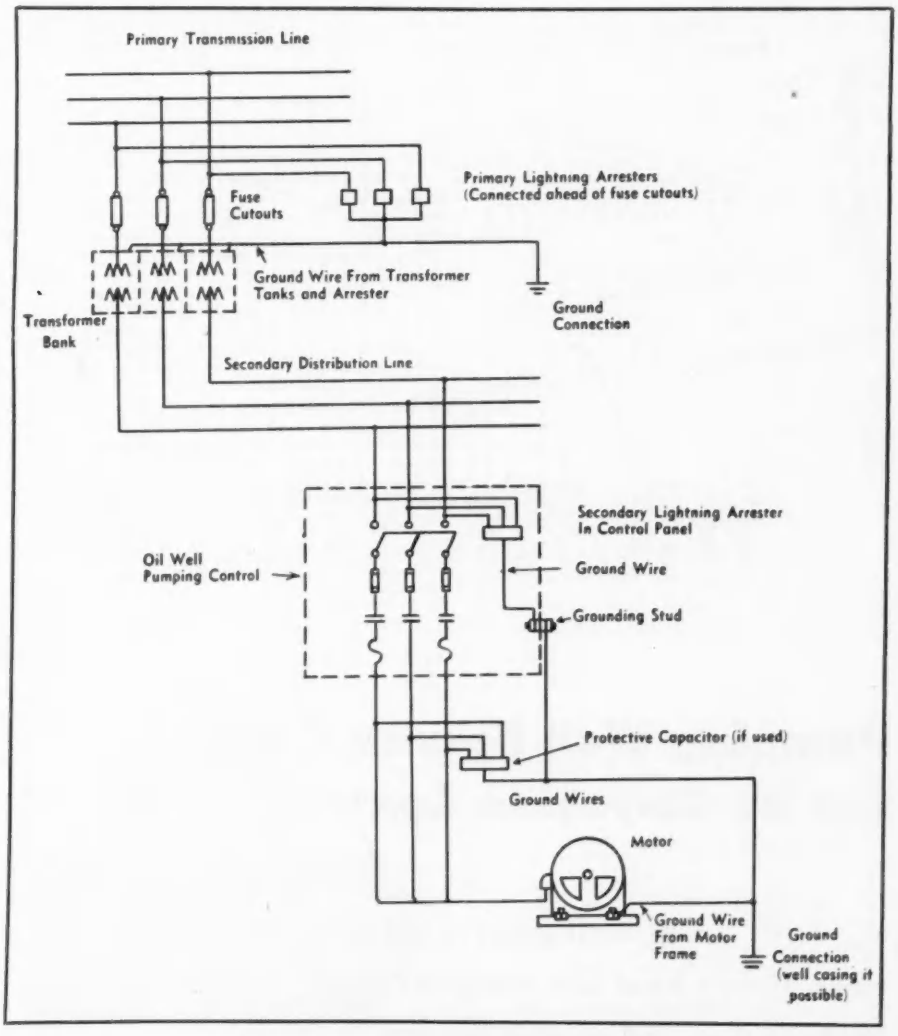
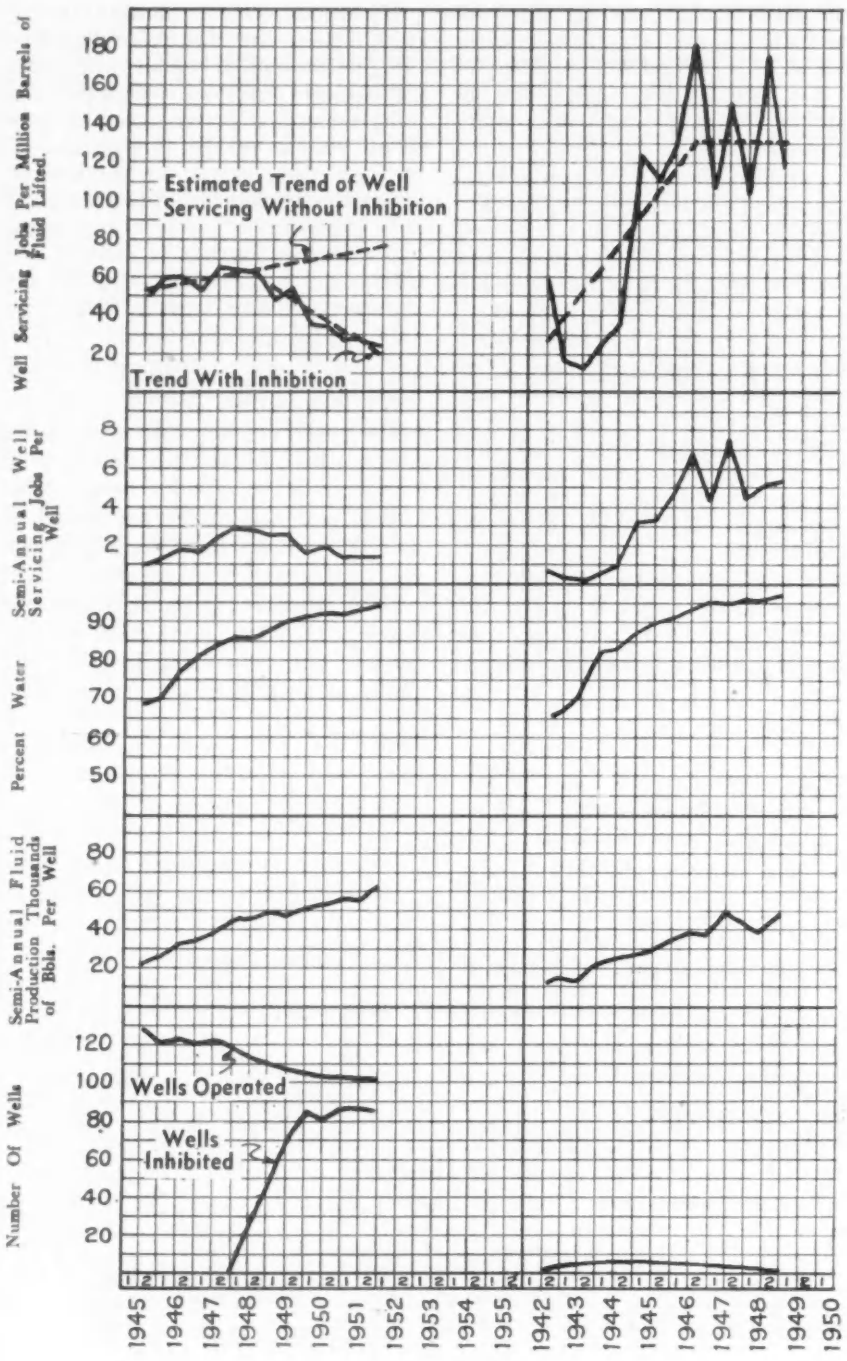


FIGURE 6
Recommended connections for oil well pumping installation including connections for all lightning protective equipment.


Well Servicing Jobs Per Million Barrels of Fluid Lifted.
Estimated Trend of Well Servicing Without Inhibition
Trend With Inhibition
Semi-Annual Well Servicing Jobs Per Well
Percent Water
Semi-Annual Fluid Production Thousands of Bbls. Per Well
Number Of Wells
Wells Operated
Wells Inhibited
1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1942 1943 1944 1945 1946 1947 1948 1949 1950

Pumping Well Service Costs Cut by Corrosion Control

Big savings have resulted in maintenance costs. Here's what one company saved on repair jobs in short time and what it expects in future.

By BRYANT W. BRADLEY
Corrosion Engineer,
Shell Oil Company, Tulsa

CORROSION INHIBITORS have been found to reduce drastically well servicing costs in pumping wells due to corrosion failure of rods, tubing and pumps. In the Trapp field of Kansas, approximately $110,000 has been saved by Shell in well service costs due primarily to effective corrosion mitigation from 1948 through 1951 in this sour crude area. About $10,000 was knocked off the anticipated well servicing bill in Centralia, Ill., in 1951 as a result of instigating a corrosion control program in mid-1950. Seven wells in three north central Oklahoma fields were placed under inhibition in January, 1952. In the short time since the program was instigated, average maintenance costs per well was reduced about $90 per month.

In the case of sour wells, tests of two inhibitors indicate that they prevent any significant increase in internal casing corrosion when examined by follow-up casing caliper surveys. The saving made possible by inhibitor treatment includes not only reduction in well pulling and equipment replacement costs, but increased reserves brought about by a longer economic life due to lower operating costs, and higher average monthly production due to less down time.

Oil well corrosion has long been a problem in pumping wells producing both sour and sweet crude.[1] In sweet wells, corrosion is probably caused by the acidic nature of the produced brine which has been found to contain dissolved carbon dioxide and organic acids. Corrosion in sour wells, which is probably more severe than sweet well corrosion, is caused principally by the action of hydrogen sulfide in the presence of produced brine. These acidic gases, when dissolved in oil well brines at bottom-hole pressures, are believed to lower the pH of the water much below the values of 5.5 to 6.5 which have been measured at the well head.[2] These acidic brines, in addition to causing weight-loss type of corrosion to all down-the-hole equipment, also lower the endurance

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limit of sucker rods which results in short rod life and increased well servicing costs.

Control Measures. In an attempt to improve the endurance limit of sucker rods, early work dealt with development of low alloy rods.[3] The SAE 4600 and 4800 series rods presently used in many corrosive wells offer some advantages, but they are not completely satisfactory. Recently successful tests of high alloy rods, such as aluminum-bronze and nickel-copper, have been experienced in sour wells, but the high initial costs of these materials are difficult to justify during the late life of a high percent water producer.

Another problem encountered in wells equipped with high alloy rods, tubing, and pumps is corrosion of remaining down-the-hole equipment. For example, a string of nine percent nickel rods, ten joints of five percent nickel tubing with two-step, square-type thread couplings, and a stainless steel pump were recently tested in a sour Arbuckle well in the Trapp field. The rods have operated 30 months without failure, while the tubing and pump have been in service for 13 months without repairs. However, during this period internal casing corrosion, in both the vapor space and below the fluid level, probably caused damage costing more to repair than would have occurred with conventional equipment using inhibitors.

During the initial stages of solving the pumping well corrosion problem, caustic was injected down the annulus of corrosive wells in an effort to neutralize the acidic brine.[4] It was found that excessive amounts of caustic were required to neutralize the corrosive brine in wells making large amounts of water. In addition, the treatment brought about a new problem due to the scale forming characteristics of the materials precipitated during the neutralization process.

It was not until 1946 that formaldehyde, an effective and economical corrosion inhibitor, was tested in the laboratory and in eight sour crude wells and found to inhibit corrosion by sulphide brines.[5] A later report revealed that formaldehyde treatment successfully prevented corrosion and affected significant reduction in well servicing costs in sour wells in three Western Kansas fields.[6] During the same period field tests of oil-soluble inhibitors, conducted in both sweet and sour crude pumping wells, indicated that they too might also be used to reduce well servicing costs experienced in corrosive wells.[7,8]

Once the effectiveness of these inhibitors had been established, numerous operators initiated the treatment in corrosive wells. A survey conducted prior to March 1951 revealed there were 3294 wells in Kansas, west of Greenwood County, classified as being corrosive.[9] Of this number, 2889, or 87.7 percent, were being treated with one of several inhibitors to control the ravaging effects of corrosion. In 1948 Shell Oil Company initiated a corrosion control program in Kansas which has continued to expand since that time. Today 320 of the 444 wells operated by Shell in Kansas and approximately 30 wells in Illinois, Oklahoma and North Texas are receiving inhibitor treatment.

Sour Crude Fields. The first wells to receive treatment were 22 offensive wells in the Trapp field, Kansas. The well servicing and producing history of the wells in the Trapp field since 1945 are shown in Figure 1. The top two curves show the semi-annual well servicing jobs per well which has been reduced from 3 to 1.4, and the number of jobs per unit volume of fluid lifted. The latter is indeed significant since the average well production has increased from 46,000 barrels to 63,000 barrels per six months since the program was initiated. Corrosiveness of the wells has also probably increased since the average water production per well has increased from 86 percent to 95 percent during the same period. If the effectiveness of an inhibitor is to be evaluated then it is necessary to consider the well servicing jobs per unit volume of corrosive fluid handled as shown on the top curve.

In addition to the reduction in well servicing frequency indicated by these

TABLE 1

Comparison of Well Servicing Costs Before and After Corrosion Inhibition
Trapp Field, Kansas

	THREE SIXTEEN MONTH PERIODS		
	Before Inhibition	After Inhibition	
	March 1947 Through June 1948	February 1949 Through May 1950	September 1950 Through December 1951
Average Wells Operated	118	106	102
Average Wells Inhibited	0	65	86
Total Well Servicing Jobs	879	566	391
Total Fluid Lifted in Barrels	13,500,000	14,100,000	15,500,000
Cost for Well Servicing Unit	$18,400	$14,000	$ 9,500[1]
Labor Cost	35,000	26,000	21,700[2]
Cost of Replacement—Rods, Tubing, Pumps	36,600	25,000	16,800[1]
Total Well Servicing Costs	90,100	65,000	48,000[1]
Cost of Well Servicing Job and Replacement Equipment Per Job	$103.00	$115.00	$123.00
Cost of Well Servicing and Equipment Per Well Per Month	47.80	38.30	29.30
Average Number of Jobs Per Well Per Month	0.465	0.333	0.240

[1] Estimated from costs experienced during second period.
[2] Estimated from man hours per servicing job experienced during first and second period. Wage rate applicable at the time used in calculating labor cost.

TABLE 2

Comparison of Monthly Well Servicing Frequency in Seven North Central Oklahoma Sweet Crude Wells Before and After Inhibition.

FIELD	Well	AVERAGE MONTHLY WELL SERVICING FREQUENCY		Reduction In Monthly Well Servicing Frequency	Jobs Saved During Five Months of Treatment
		12 Months Before Inhibition	5 Months After Inhibition		
Lucien	1	2.00	0.60	1.40	7
	2	0.83	2.20	—1.40	—7
North Braman	1	1.66	0.60	1.06	5.3
	2	3.33	1.60	1.70	8.5
Tonkawa	1	2.50	1.20	1.30	6.5
	2	1.75	1.60	0.15	0.75
	3	2.08	1.40	0.68	3.4
Total Jobs Saved During Five Month Test	....	.....	.....	.....	24.45

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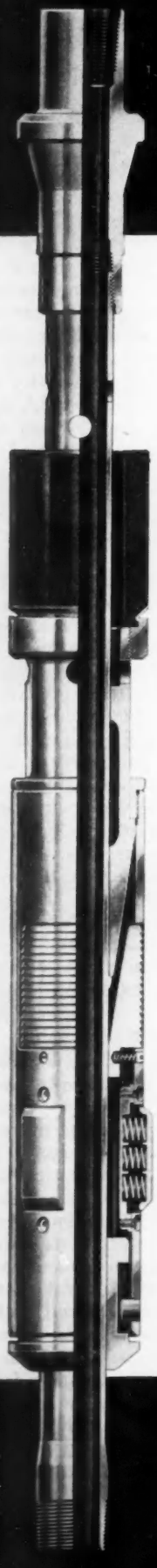

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RUNS IN WITHOUT DIFFICULTY: The O-C-T Packer is small in diameter so that it goes right through tight spots. Large fluid by-pass areas permit fast running. Automatic clutch eliminates premature setting.

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HOLDS PRESSURE WITHOUT FAILING: The packing element requires only small longitudinal compression to pack-off. This results in longer compressed length with minimum distortion. When set with 25,000-lb. tubing load and subjected to 6000-lb. pressure at 300° temperature, exhaustive tests showed no leakage or failure of the heavy duty oil-resistant packing.

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curves, it would also be desirable to compare costs both before and after inhibition. Table 1 compares the well servicing costs of Trapp field wells during a 16-month period before inhibition with two like periods after inhibition.

It will be noted that inflation has increased the cost to pull a well and replace equipment by an average of $20 per job since corrosion inhibition was initiated. However, during the same time the monthly well servicing and equipment replacement cost has been reduced from $47.80 to $29.30 or $18.50 per well. If costs had not risen during this inflationary period, the saving in servicing and equipment replacement would have been approximately $23.10 per well per month for a total annual saving rate of about $28,300 during the second 16-month period.

In an effort to estimate the number of well servicing jobs that might have been required without inhibition, the dotted line representing an extrapolation of the well servicing trend has been added to top curve of Figure 1. The total actual well servicing jobs since inhibition is approximately 1500 jobs less than the number represented by the extrapolated curve which would probably have been required without inhibition. By assuming an average servicing job cost of $100, then $150,000 in well servicing expense alone has been saved since starting inhibition in the Trapp field.

After deducting the cost for inhibitor during this period, which was slightly higher than the present average monthly inhibition cost of $11.20 per well in Kansas, the net saving is approximately $110,000. The validity of the extrapolated curves is supported by Figure 2 which shows the actual well servicing curves for seven Arbuckle Trapp field wells which were plugged before the corrosion control program was established.

Treatment and Benefits. Treatment rate of oil-soluble inhibitor, the inhibitor principally used in the Trapp field, was originally based on a chemical-to-oil ratio of 1:4000 with a minimum of two pints daily. This treatment was applied daily by lubricating the chemical down the annulus followed by a 15- to 20-minute flush with the produced fluid. However, as the number of inhibited wells increased, this treatment required more and more of the pumper's time. Accordingly, after a test period, which indicated continued protection, the treatment was changed to three times the daily amount every third day based on the 1:4000 ratio.

This resulted in additional savings since many wells were receiving the minimum treatment of two pints regardless of the chemical-to-oil ratio. Further tests indicated that the treatment rate could be lowered to 1:6000 chemical-to-oil ratio without loss of protection. This is the current treatment rate being used in the 320 Kansas wells under inhibition.

Internal vapor space corrosion of the casing is a very critical problem also present in sour crude wells. It is thought to be caused by acidic gases dissolved in water which condenses on the walls of the casing. Since this problem also needed to be solved it was decided to run casing caliper surveys in five Trapp field wells before and after inhibition to evaluate any protection which might be obtained.

Of the three follow-up caliper surveys, none have indicated any significant change in the internal condition of the casing. Two wells were inhibited with formaldehyde during the test period while the third was treated with an oil-soluble inhibitor. Laboratory tests indicated that sour Arbuckle oil from the Trapp field had very good metal wetting characteristics when mixed with the oil-soluble organic inhibitor in use at that time. In view of these data, and due to widespread casing failures caused by internal casing corrosion, the present policy is to inhibit all sour wells with two pints of oil-soluble inhibitor per week to control casing corrosion. The criterion followed in changing or starting the treatment rate to the standard 1:6000 chemical-to-oil ratio was:

- Inhibit all Arbuckle wells producing more than 65 percent water even if only minor subsurface trouble has been experienced.
- Inhibit all Arbuckle wells experiencing high servicing frequency due to corrosion.
- Inhibit wells producing from formations other than the Arbuckle if they experience a higher well servicing frequency than inhibited Arbuckle wells.

Having established these policies, inhibition was initiated in several fields producing sour water before the trend of well servicing frequency began to climb. Thus, the curves for other fields, similar to those in Figure 1, sometimes never indicate a significant increase in well servicing frequency.

Sweet Crude Inhibition. After the corrosion control program indicated inhibitors were effective in reducing the well servicing frequency in wells producing sour crude, it was only natural that inhibition be tested in troublesome sweet crude wells. Usually troublesome sweet wells were found to produce a high percent water which contains dissolved carbon dioxide, organic acids, and in some cases, traces of hydrogen sulfide. A large amount of brine alone might possibly be responsible for many rod failures simply due to the influence of salt water on the endurance limit of sucker rods.

Oil-soluble inhibitors have been successful in reducing well servicing costs in sweet wells in Kansas, Illinois and Oklahoma. Corrosion inhibition tests have been initiated in two North Texas wells and plans are underway to examine the well servicing records of several additional wells in north central Oklahoma where excessive failure of down-the-hole equipment is suspected. Although inhibition is relatively new in sweet pumping wells, significant savings are indicated by preliminary data.

For example, eight Devonian wells in the Centralia, Ill., field experienced well servicing costs of $10,259 in 1949 and $19,081 in 1950. Inhibition was begun in mid 1951 in these wells and servicing costs for 1951 were held to $12,969, which included an inhibition cost of approximately $1 a day per well. This was approximately $6000 less than for 1950 and about $10,000 less than the estimated 1951 well servicing cost.

Seven wells in three north central

■ CONTINUED ON PAGE 226

About the Author

BRYANT W BRADLEY, corrosion engineer for Shell Oil Company, Tulsa, Okla., graduated from The Rice Institute in 1944 with a B. S. degree in chemical engineering. Following graduation he served in the U.S. Navy for 27 months. On release from active duty he returned to the University of Texas and obtained a MBA degree in 1948. He joined Shell Oil Company at that time and was assigned to corrosion control work in 1950.

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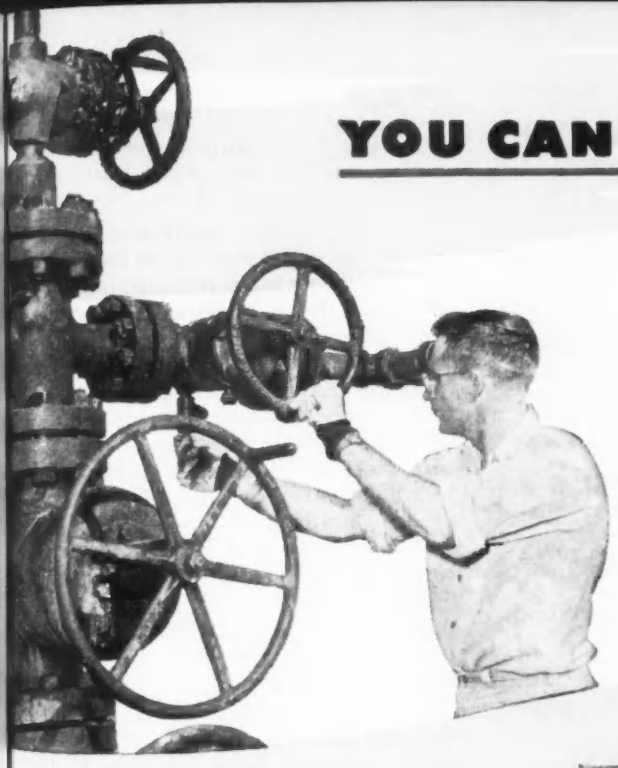
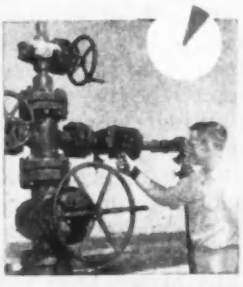
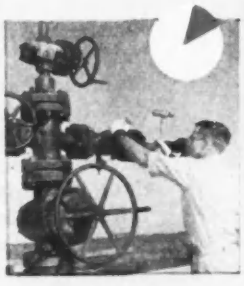
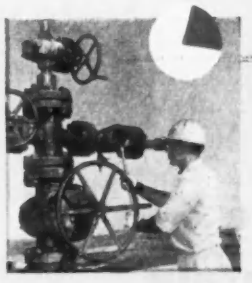




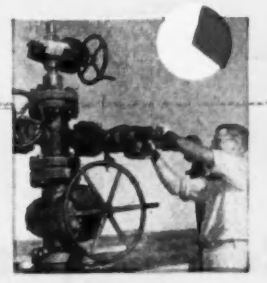
1&2 Bleeding pressure out of valve (top) and out of packing gland (above).



3 Removing bonnet clamp ring.



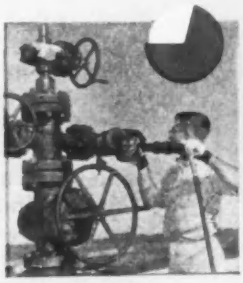
4 Removing bonnet seal ring.



5 Removing bonnet, gate and segment.

6 Breaking seals loose.

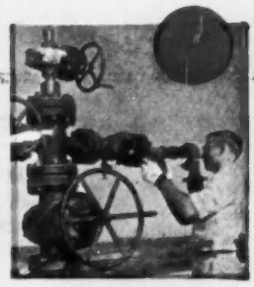
7 Removing worn seals.



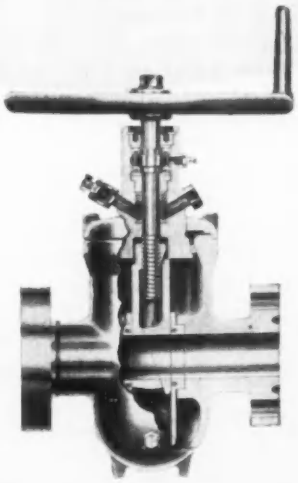
8 Installing new seals.

9 Installing new gate and segment.

10 Replacing stem, bonnet and bonnet seal ring.



11 Replacing clamp ring and the job is done. Elapsed time: one hour.



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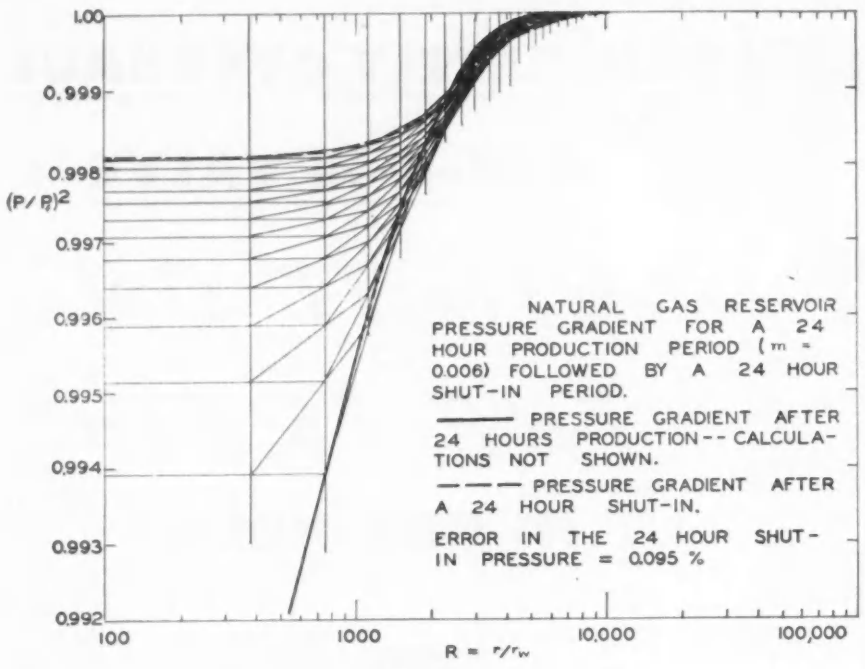

FIGURE 1.

How You Can Compute Gas Reserves More Accurately

- **Method requires only one pressure measurement.**
- **Less shut-in time required.**

By DR. DAVID CORNELL
Texas Petroleum Research Council, Austin

GAS RESERVES can be estimated more accurately and with less well shut-in time by a graphic method that needs only one pressure measurement. Charts for predicting the error in 24-hour and three-day shut-in pressures for natural gas wells have been prepared. These charts are used to compute the equalized reservoir pressure and gas reserves from a single pressure measurement.

Computation of gas reserves of natural gas reservoirs requires an accurate value of the shut-in reservoir pressure before and after a known volume of production. For many gas wells, the time required for the bottom-hole pressure to approach the equalized reservoir pressure may be considerable.

Occasionally, 24-hour or three-day shut-in pressures are used with an empirical correction factor for computing reserves. This paper presents the computed error in shut-in pressures in terms of the quantity and rate of production, the characteristics of the reservoir, and the properties of the gas. It is of importance in estimating gas reserves more accurately than previously possible.

Accuracy of the calculation of gas reserves is dependent upon two factors. Since one large pressure is being subtracted from another large pressure to obtain a rather small pressure difference, the measurement of the pressures must be precise. In addition to accurate pressure measurements, the true equilibrium reservoir pressure must be obtained from the bottom-hole pressure. Because of the pressure gradient set up in the reservoir during the flow of gas from the formation, a certain length of time must be allowed for the bottom-hole pressure to approach the equalized reservoir pressure within a specified degree of accuracy.

Two methods have been used in the past to obtain the equalized reservoir pressure from bottom-hole pressure measurements. Arps and Smith,[1] Kemler,[6] Muskat,[8] and others have presented methods of extrapolating bottom-hole pressure build-up data to obtain the equalized reservoir pressure. These methods have the disadvantage of requiring extensive test data. Some of the procedures involve differentiation of the experimental data, thus magnifying any experimental errors. Prediction of bottom-hole pressure build-up characteristics has been treated by Miller, Dyer and Hutchinson[7] by fixing a radius of drainage corresponding to an arbitrary period of production prior to the shut-in. They used an analogue computer for handling the unsteady state equations. In order to avoid extensive field testing of wells, an alternative procedure that is not based upon build-up data has been used.[5] This method utilizes a three-day shut-in pressure with an empirical correction factor. In the Hugoton field the three-day shut-in pressure is obtained and a correction of 26.6 pounds per square inch is added to obtain the equalized pressure. Errors in 24-hour and three-day shut-in pressures have been computed and are presented so that one shut-in pressure measurement may be made and then corrected to the proper equalized pressure value.

Theory. The procedure for establishing the pressure gradient in a natural gas reservoir was worked out by Cornell and Katz.[3] Computed pressure gradients for the constant flow rate case were given by Cornell.[2] Having established the pressure gradient at the end of the production period, the

Wülfel-Deep Well Pumping Units

are characterised by the extreme ease with which stepless adjustment and re-adjustment of the counterbalancing effect can be obtained.

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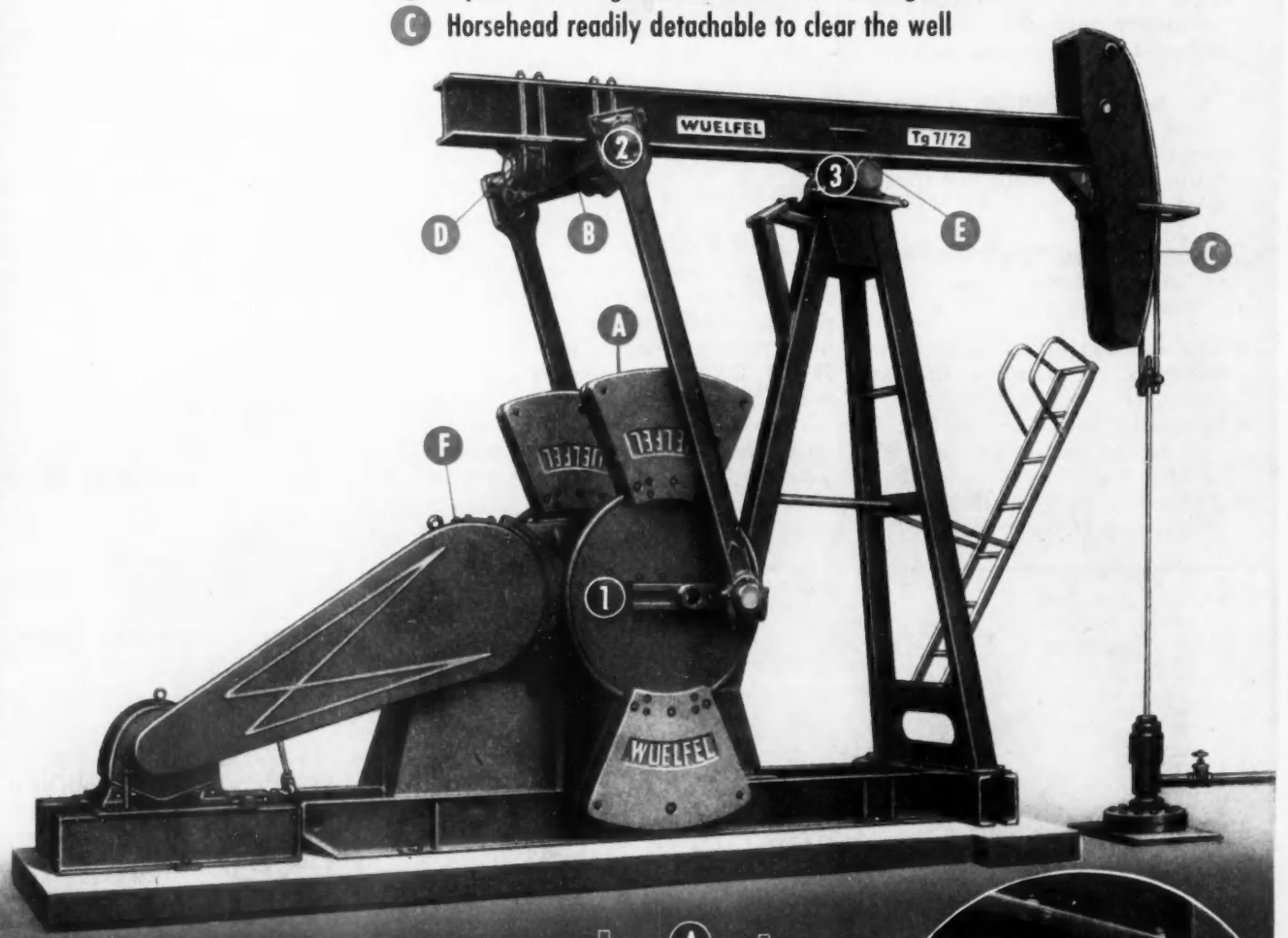

- **D** Rubber-Bush Type Bearings (Silentblocs) damp shocks and vibrations and lengthen life of sucker rods
- **E** Automatic Scoop Lubrication in saddle bearings and upper pitman bearings reduces attendance to practically nil
- **F** Inside Jaw Brake of modern design on pinion shaft, ensuring rapid actuation

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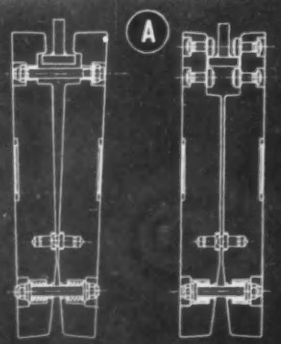

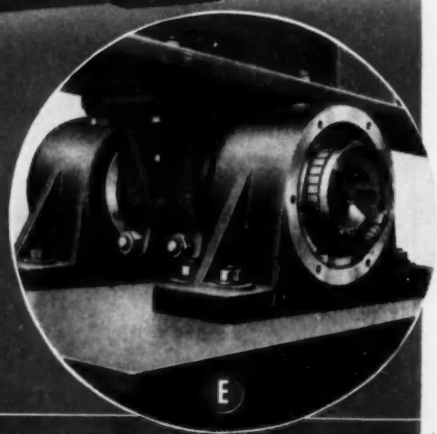

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same graphical procedure may be used to predict the behavior of the reservoir when the well is shut in.

A particular set of boundary conditions must be applied to the fundamental partial differential equation governing radial, laminar flow of gas in the formation. These are:

- The initial pressure distribution throughout the reservoir is that created by producing gas from the reservoir at a known rate for a definite period of time following a shut-in period.
- The pressure gradient at the well bore is zero. This boundary condition neglects the flow of gas into the well bore after shutting in the well. For a given case the calculation procedures could be revised to remove this assumption.
- The reservoir is infinite in extent. Again, another boundary condition such as that of a finite reservoir could be employed if desired.

In addition, several simplifying conditions and assumptions have been used. These include:

- The formation is of uniform thickness, permeability, and porosity.
- Effects of liquids in the formation on the flow of gas are negligible.
- The producing formation is completely penetrated.

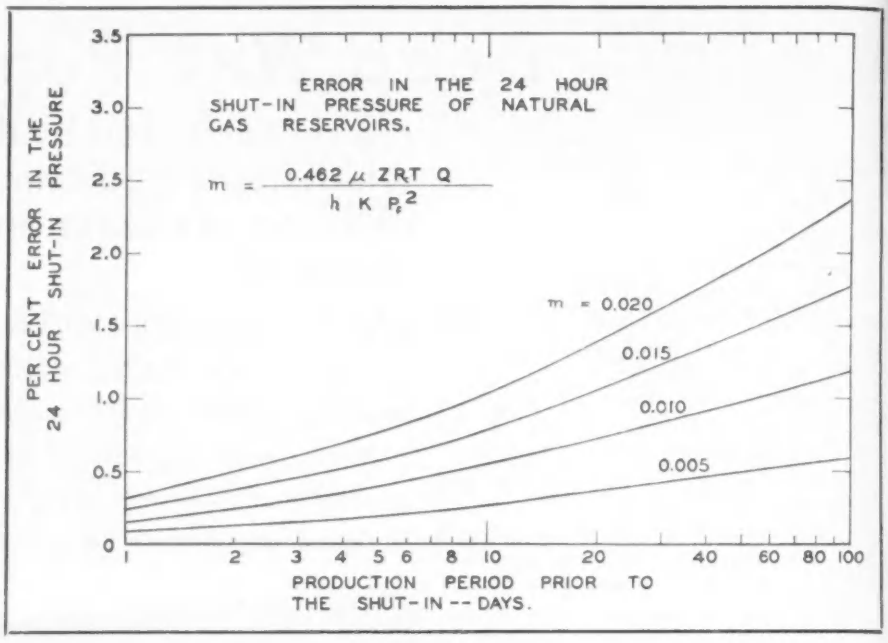

FIGURE 2.

- No water drive is present.
- The term, $Kp/\mu\phi$, is a constant using $P = P_{avg}$.

Figure 1 shows how the errors in the 24-hour and three-day shut-in pressures were computed. For a 24-hour prior production period having $H = 1{,}728{,}000$, the pressure gradient was obtained from previous work[2] corrected to $m = 0.006$, and plotted on Figure 1. This represents the pressure gradient just before the well is shut in. The 24-hour shut-in pressure was then calculated using 24, one hour steps. The error was found to be 0.095 percent in this case.

Figure 2 and Figure 3 were made up from sets of calculations similar to Figure 1. These plots show the computed error in the 24-hour and three-day shut-in pressures as a function of the period of production prior to the shut in with the dimensionless quantity, m, as the parameter. For example, if the three-day shut-in pressure after 100 days of production at $m = 0.012$ is 1000 pounds per square inch absolute, the error in that pressure is one percent or $(1000)(.01) = 10$ psi, so the correct equalized reservoir pressure would be 1010 psia.

Effect of the various conditions and assumptions used in preparing Figures 2 and 3 are believed to be as follows:

- Flow of gas into the well bore will increase the error in the shut-in pressure above the computed error.
- A lower permeability zone near the well bore, a partially penetrating well, or the accumulation of liquids near the well, will increase the error in the shut-in pressure.
- Presence of a water drive and other irregularities in the formation may have a variable effect on the shut-in pressure.
- Use of P_{avg} in the $Kp_{avg}/\mu\phi$ term will have no effect on the error because this term determines the original pressure gradient as well as the shut-in pressure gradient and any effects are canceled out. It is for this same reason that

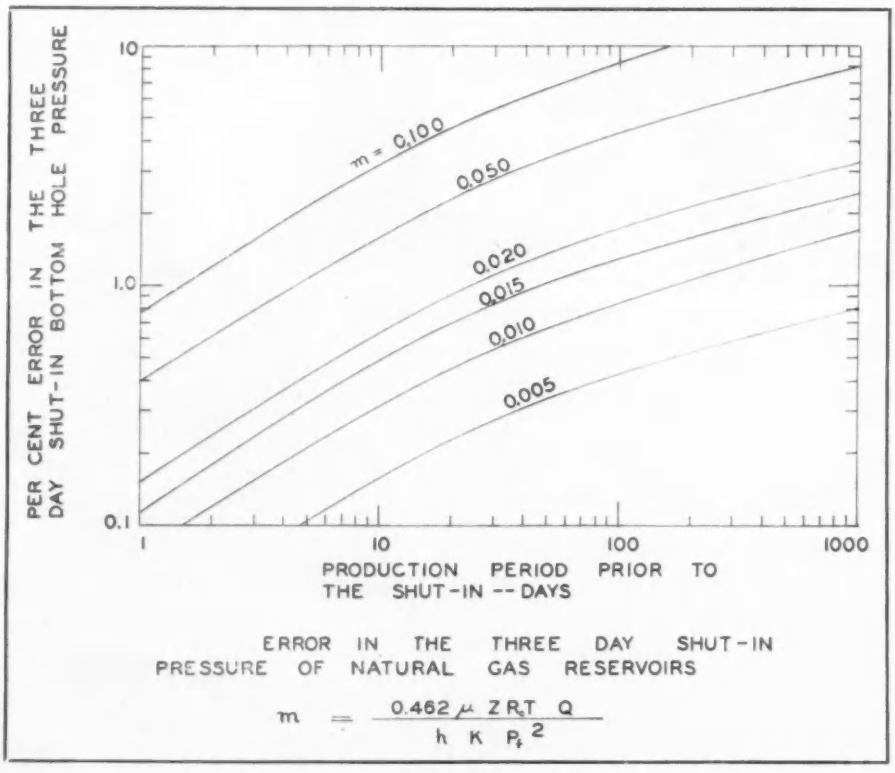

FIGURE 3.

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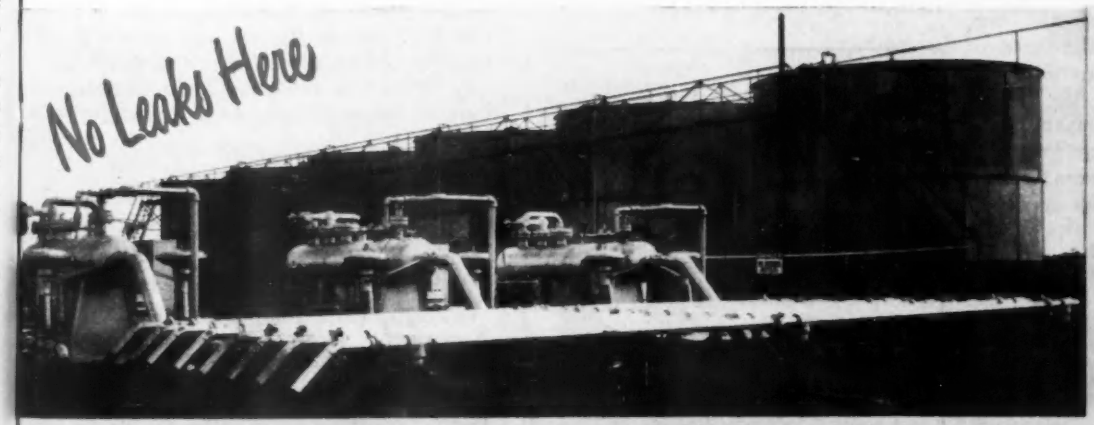

TANK BATTERIES The tank batteries, foreground, and portable separator units, background, are both Nordstrom-valve equipped.

CHRISTMAS TREE Nordstrom Hypreseals on 15,000 lb. test Christmas tree in Gulf area. Pump carries inhibitor into well head to prevent corrosion.

SALT WATER DISPOSAL Nordstrom Hypreseal valve, with Merchrome hard-faced plug and flow passages on Louisiana well.

Wherever you are in the oil fields, there's a supply store with Nordstrom valves and Nordstrom service nearby.

porosity does not appear as a variable in Figures 2 and 3.

Application. Table 1 shows data presented by Katz[5] on the error in the three-day shut-in well head pressures in the Hugoton field. Table 2 gives further information for this field. Figure 3 can be compared roughly with these data. Assuming that the percent error in the well head pressure is equal to the percent error in the bottom-hole pressure, the first well test given in Table 1 has a 5.63 percent error in the observed pressure after 123 days production at 265 thousand cubic feet of gas per day at 16.4 psia and 60 degrees Fahrenheit. From Figure 3, the value of m is estimated to be about 0.060. The production rate in terms of standard cubic feet of gas at 14.7 psia and 60° F. is (265) (16.4) / (14.7) = 296 MCF/D. The permeability feet for this well then must be:

$$hK = \frac{(0.462)(0.012)(0.94)(1545)(551)(296)}{(0.060)(450)^2}$$

= 108 millidarcy feet

A comparison of this value of millidarcy feet with that obtained by core analysis would be interesting. More exact information about the well and the bottom-hole pressures would be required for a true comparison. Due regard should be given to the importance of the assumptions involved in the computed errors. Once the millidarcy-feet term has been established for a well, the procedure can be used for the computation of reserves from a single shut-in pressure measurement.

ACKNOWLEDGMENT

This work was supported by the Texas Petroleum Research Committee at The University of Texas, Austin, Texas.

TABLE 1

Typical Observed Errors in Three Day Shut-In Well Head Pressures for the South Hugoton Field

Source of Data: Katz, D. L.[5]

Production Period Prior to the Shut-In Days	Daily Average Production MCF/D @ 16.4 psia	Observed Error in the Three-Day Shut-In Well Head Pressure, Percent
123	265	5.63
69	1,008	4.31
124	597	9.05
180	792	6.52
154	666	5.82
65	1,471	8.29
173	124	5.56
13	905	7.15
88	455	6.08
89	932	9.74

TABLE 2

Hugoton Field Information

Data from Haymaker, Binckley, and Burgess[4]

Average Bottom Hole Temperature	91° F. 551° R.
Gas gravity	0.61
Molecular weight of the gas	17.1
Estimated information:	
Average shut-in formation pressure	450 psia
Average compressibility factor of the gas	0.94
Average viscosity of the gas	0.012 cp

NOMENCLATURE

- h = thickness of the producing formation, feet
- K = permeability, millidarcies
- $m = \frac{(0.462)(\mu)(z)(R_c)(T)(Q)}{(h)(K)(p_f^2)}$, dimensionless
- P = pressure, psia
- $P_{avg} = (P_s + P_f)/2$, psia
- P_s = formation pressure, psia
- P_f = bottom hole pressure, psia
- Q = rate of production, MCF/D at 14.7 psia and 60° F.
- r = radius, feet
- r_w = radius of the well bore, feet
- $R = r/r_w$
- R_c = gas constant, 1545
- T = absolute temperature, degrees Rankine
- z = compressibility factor
- Θ = time, minutes
- $H = \frac{(4.39 \times 10^{-6})(K)(P_{avg})(\Theta)}{(\mu)(\phi)(r_w^2)}$, dimensionless
- μ = viscosity, centipoise
- ϕ = fractional porosity

REFERENCES

[1] Arps, J. J., and Smith, A. E., "Practical Use of Bottom Hole Pressure Buildup Curves," *Oil and Gas Journal* 47, p. 91 (April 28, 1949).

[2] Cornell, David, "How To Determine Gas Well Interference Graphically," WORLD OIL, Nov., 1952, p. 187.

[3] Cornell, D., and Katz, D. C., "Pressure Gradients in Natural Gas Reservoirs." Paper to be presented before the AIME in Houston, Oct. 2, 1952.

[4] Haymaker, E. R., Binckley, C. E., and Burgess, F. R., "Method of Establishing a Stabilized-Back Pressure Curve for Gas Wells Producing From Reservoirs of Extremely Low Permeability," *J. Petroleum Technol.* 1, p. 71 (1949).

[5] Katz, D. C., "Pressure Difference Between Reservoir Equalized Pressure and Three Day Shut-In Pressure," Federal Power Commission Docket G-1302, Exhibit 91 (March 15, 1950).

[6] Kemler, E. M., "The Application of Build-up Pressures to Calculating Capacity and Reservoir Pressure for Gas Wells," *The Oil Weekly* 108, p. 28 (January 4, 1943).

[7] Miller, C. C., Dyer, A. B., and Hutchinson, C. A., Jr., "The Estimation of Permeability and Reservoir Pressure From Bottom Hole Pressure Build-up Characteristics," *J. Petroleum Technol.* 2, p. 91 (1950).

[8] Muskat, M., "Use of Data on the Build-up of Bottom Hole Pressures," Trans. AIME 123, p. 44 (1937).

About the Author

DAVID CORNELL joined the chemical engineering faculty at the University of Texas in 1952 after receiving a Ph.D. in chemical engineering at the University of Michigan. Previously he had received a BSChE degree and MSChE from the same school. Before completing his under-graduate work he spent nearly two years in the Navy as an electronics student and as an instructor in a naval electronics school. While doing graduate work in chemical engineering at the University of Michigan he spent two years working for the research and development department of the Blaw-Knox Division of the Blaw-Knox Company.

Well Service Costs Cut

• CONTINUED FROM PAGE 218

Oklahoma fields were placed under inhibition in January 1952. A comparison of the average monthly well servicing frequency before and after treatment is shown in Table 2. All wells except one appeared to benefit from treatment with corrosion inhibitor. An inspection of the record revealed the rods in this one exception failed eleven times between January 7 and March 25 with no additional failures through June 9.

The rods were in exceptionally bad condition, and after weeding out the weak rods, the inhibitor may begin to show beneficial results in this well. The minor reduction in servicing frequency noted in Well Nos. 2 and 3 in the Tonkawa field possibly was due to the very high water production of about 98 percent. Accordingly, the inhibitor treatment rate was recently increased for additional testing. It is significant to note that the monthly well servicing frequency is much higher than experienced in the average sour well in the Trapp field.

Inasmuch as the average well servicing job and replacement equipment in these fields costs about $150, it is reasonable to assume that a saving of about $3600 in well servicing costs has been made during the past five months. After paying for the inhibitor, this is an average reduction in costs of about $90 per well per month.

REFERENCES

[1]Protection of Oil and Gas Field Equipment Against Corrosion, R. Van A. Mills, Bureau of Mines Bulletin 233, 1925.

[2]Laboratory Apparatus for Studying Oil Well Sub-Surface Corrosion Rates and Some Results, Walter F. Rogers, J. A. Rowe, and P. J. Kalish, presented at N.A.C.E. Annual Conference, March 12, 1952, Galveston, Texas.

[3]Economical Selection of Sucker Rods, Blane B. Wescott and C. Norman Bowers, A.I.M.E. Petroleum Development and Technology in 1935, p. 177-189.

[4]U. S. Patent No. 1,829,705, October 27, 1931 and U. S. Patent No. 1,873,084, August 23, 1932, John C. Walker, assignor to Empire Oil and Refining Company.

[5]Formaldehyde as an Inhibitor of Corrosion Caused by Hydrogen Sulphide, P. L. Menaul and T. H. Dunn, A.I.M.E. Petroleum Development and Technology in 1946, p. 26-34.

[6]Practical Results of a Planned Oil Well Corrosion Prevention Program in Western Kansas, Walter C. Pearson, presented at the Spring Meeting of the Mid-Continent District A.P.I. Division of Production, Wichita, Kansas, March 25-26, 1948.

[7]Prevention of Corrosion in Sour Wells with Organic Inhibitors, William F. Gross and Howard W. Andrews, Oil and Gas Journal, October 28, 1948, p. 76.

[8]Economics of Oil Well Corrosion Control, Robert J. Villagrana and William W. Messick, A.P.I. Drilling and Production Practice, 1949, p. 397.

[9]Control of Sour Crude Corrosion in Kansas Production Operations, L. C. Case, Corrosion, Vol. 7, No. 11, November 1951, p. 395.

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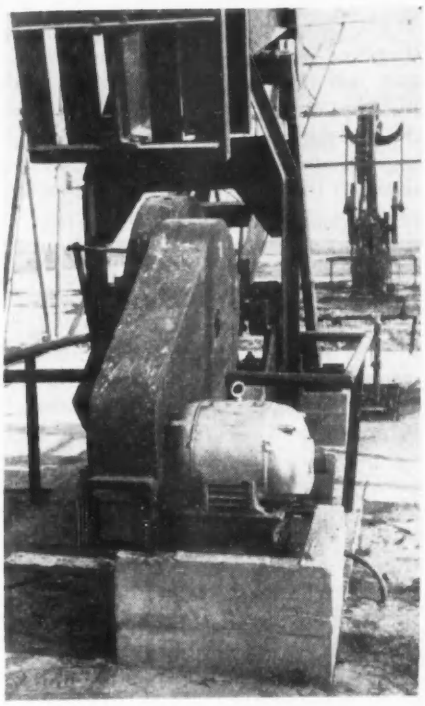

Hinged Belt Guard Is Removed Quickly

Considerable time and effort can be saved when changing or inspecting the vee belts on an electrically-driven pumping unit by hinging the belt guard. Sheet metal vee belt guards protect the belts from the weather as well as preventing personnel and live stock from getting hurt. If they are bolted at several points, the pumper may find it difficult to unscrew rusty bolts, and frequent inspection and proper maintenance would be discouraged.

The near end of this guard is welded to a U-bracket of ½-inch strap steel, slightly wider than the guard itself. Both ends of the U-bracket are drilled to accept a half-inch rod. The anchor section consists of a similar U-bracket that was about 1½ inches less in width, and is inverted from the bracket attached to the guard so that the two mesh together as shown. This anchor bracket is bolted by means of a foot piece to the electric motor mounting bolts grouted into a concrete foundation. By slipping one bracket inside the other and inserting the anchor rod, the vee belt guard can be kept in place.

The far end of the guard is supported by a hinge device that permits the guard to be raised for inspection or replacement of the belts. This type hinge anchor eliminates the need for bolts or complicated mounting supports.

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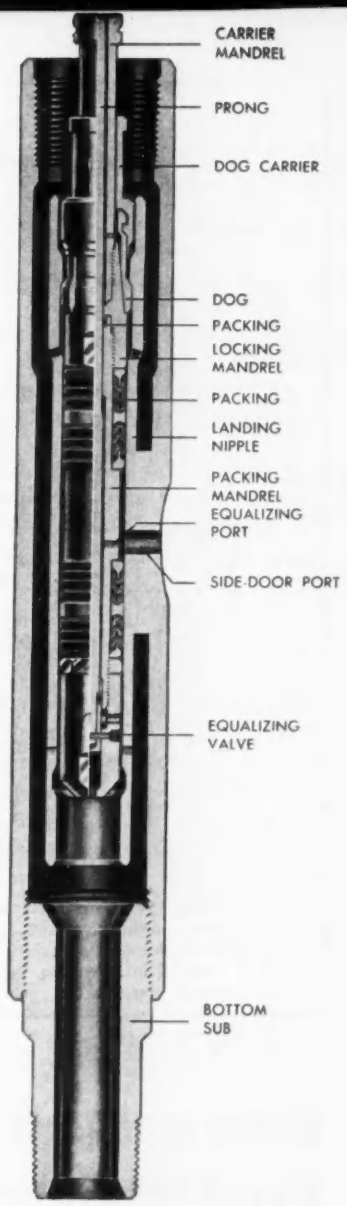

Type A Otis Side-Door Choke

The Type A Otis Side-Door Choke and Landing Nipple assembly is a new Otis dual-completion tool that provides maximum flow capacity, and is especially suited to formation-fracturing and other similar well completion operations. A new design, consisting of a landing nipple mounted concentrically within an outer flow sleeve, allows the assembly to perform all of the various functions of a conventional Otis Side-Door Choke and Landing Nipple assembly, without restricting the flow to the bore of the choke. The large by-pass area around the seating nipple provides a flow course of more than two square inches for full production through the tubing, or for acidizing, conditioning mud, taking bottom-hole pressures, and various other operations. The new Type A Choke also has a built-in equalizing device to facilitate pulling the tool in the event unbalanced or packed-off pressures prohibit full equalization across the tool. Inasmuch as the seating nipple is independent of the tubing nipple, the same choke can be run in either a 2" or 2½" string.

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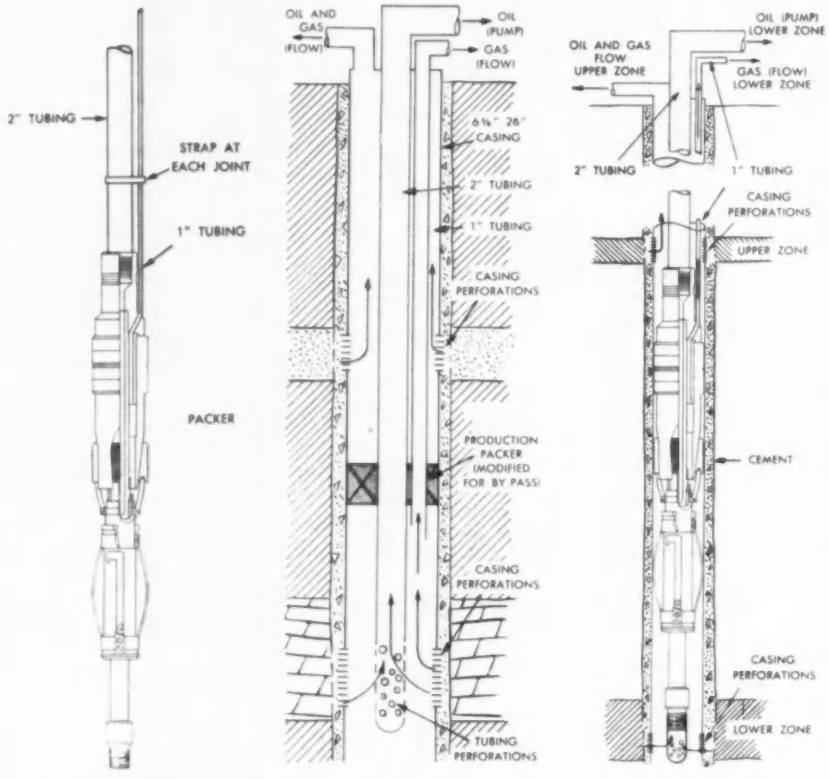


1. Modified production packer showing bypass hole drilled through collar and 1- and 2-inch tubing strapped together.

2. Diagram showing modified packer in position and mechanics by which both zones are being produced.

3. Diagram showing modified packer set between upper and lower producing zones.

Packer Modification Solves Dual Completion Problem

Hole drilled to relieve excess gas production from lower zone and prevent vapor lock of rod pump.

By C. L. KIRKMAN
Lane-Wells Company, Oklahoma City

A SIMPLE modification of a regular production-type packer enabled a Mid-Continent oil operator to produce his well successfully from two zones at the same time after it was found that normal installation packer procedure would not work.

The upper zone, Bartlesville sand, produced gas distillate from perforations at 4664-4724 feet. It had sufficient pressure to flow without artifical lifting. The lower formation, Mississippi lime, was perforated at 4780-4808 feet. Being a low-pressure zone, it required installation of pumping equipment.

A hookwall packer was run in the two-inch tubing string and set at a point in the 6 5/8-inch casing between the two zones to separate one zone from the other. With this arrangement of tubing and packer, the upper zone flowed satisfactorily through the annulus between tubing and casing. However, the lower zone would not produce by pumping or flowing. It was believed that the lower zone was making enough free gas to cause the pumping equipment to vapor lock and this was later substantiated.

The problem facing the operator was one of bleeding off the gas from the lower zone to the surface, or prevent vapor locking of the pumping equipment caused by the gas from the lower zone.

A regular production type packer such as shown in Figure 1, was modified. A bypass hole was drilled through the top collar of the packer so that the passage was open behind the packing element from the top collar down through the cone to a point below the packing element. A one-inch connection was made on top of the opening in the top collar so that one-inch tubing could be connected directly to this bypass opening.

This modified packer was lowered into the well on two-inch internal diameter tubing. A string of one-inch tubing was connected to the one-inch opening of the top collar of the packer. Metal straps were used to fasten each joint of the one-inch tubing to the two-inch tubing after the two strings were made up and before running in the well. Strapping the tubing served two purposes:

- to keep the one-inch tubing from any corkscrew action.
- by keeping the joints tied together the weight would be carried by the two-inch string. The two tubing strings were made up and the packer lowered to a point between the two zones. Standard tubing elevators were used and no exceptional operating difficulties were encountered in running the two tubing strings together.

The packer was set at the same elevation it had been set at prior to modification (Figures 2 and 3). A side door choke was installed in the two-inch tubing string immediately above the packer for the purpose of swabbing the mud from the annulus through the tubing. When the mud was removed from the annulus, the side door choke was closed.

The upper zone started flowing through the annulus between the casing and tubing strings. A string of sucker rods with pump were run inside the two-inch tubing. The gas from the lower zone was brought to the surface through the one-inch tubing. The pressure on the lower zone was relieved by venting the gas through the small tubing thus preventing the pumping equipment from vapor locking. The oil from this bottom zone was brought to the surface through the two-inch tubing by pumping.

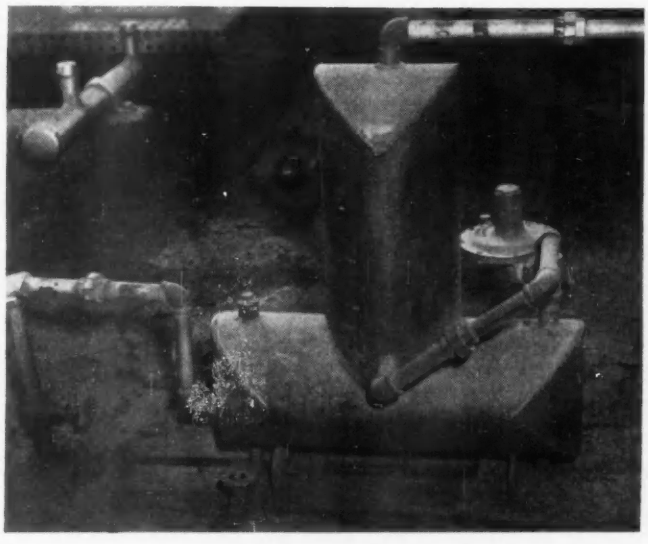
As a result of this simple packer modification the well made its allowable from each zone without further difficulty. Since the first installation, this same type application has been used successfully on a second well in a different field.

ACKNOWLEDGMENT

The author thanks Sam Shakely, general production superintendent, Anderson-Prichard Oil Corporation, Oklahoma City, Okla., for releasing and furnishing factual information.

Combination Scrubber-Tank Proves Economical

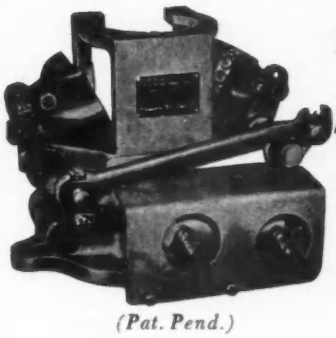
A gas scrubber and volume tank for an engine fuel system can be combined to save material, fittings and installation costs. Field gas used as fuel for various engines on the lease and tank battery must be run through a scrubber to remove condensate, moisture and foreign particles. The scrubber shown incorporates several desirable features for this type service.



Made for two sections of 12-inch casing, the scrubber measures about three feet in length and is sealed at both ends. Field supply gas enters the scrubber at the left end of the horizontal chamber through a short 1½-inch riser. The horizontal run of this inlet pipe is slightly higher than the top of the chamber. Purpose of this hookup is to prevent any liquids or solids from back flowing into the supply line when the unit is shut down.

The discharge is at the right end through a pressure regulator that reduces the field gas pressure from about 25 pounds down to 6 or 8 ounces. The volume tank, which is desirable wherever natural gas is supplied for engine fuel, is welded on top of and in the middle of the horizontal scrubber. In this manner, the two chambers are integrated and the welded seam to the scrubber form one sealed end of the volume tank. The other end, of course, is also welded closed.

Outlet from the pressure regulator is into the bottom of the volume tank, while the outlet is located in the center of the welded end on top. The entire unit rests on two saddles that have been bolted to two wooden skids which form a foundation. Both inlet and outlet lines on this unit are equipped with unions that permit quick disconnecting for moving or setting up.



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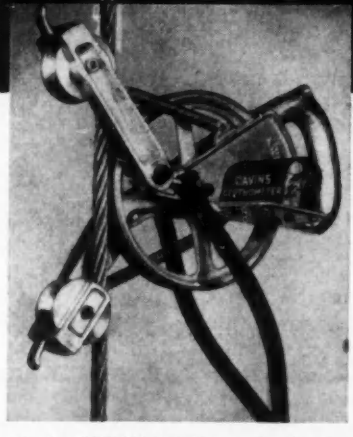

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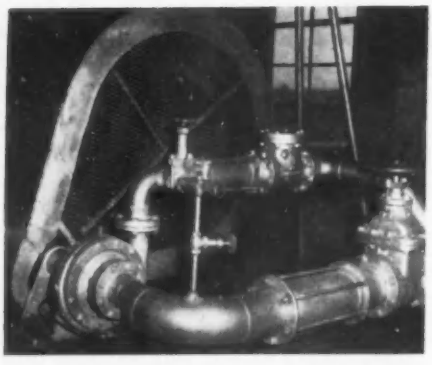


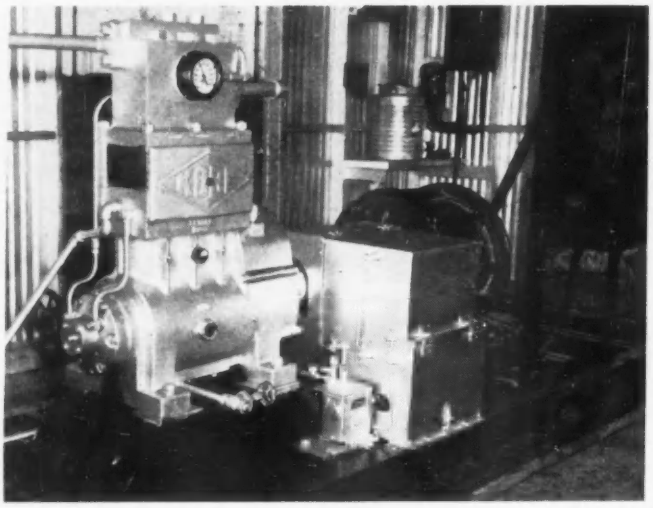
Cooling Towers Replace Radiator

A cooling tower circulating system can replace the large radiators used to cool the engine driving a small gas compressor. In a small pressure maintenance project a radiator on the compressor engine is extremely noisy and occupies considerable space. In the summertime, it is difficult to maintain desirable engine operating temperatures. To overcome this problem replace the radiator with a cooling tower to cool engine jacket water.

A centrifugal pump is driven off the flywheel of the compressor engine through vee belts. The pump suction is tied into a vertical section of casing to insure a flooded suction that maintains a liquid prime. To provide adequate supplies of water through this suction line at minimum loss of friction, it is made of six-inch pipe, although the suction is four-inch.

The pump discharge is tied into a four-inch line equipped with a check valve to prevent back flow. A 1½-inch tee is welded to the discharge line and fitted with a gate valve to provide for a circulating and clean out line should the system need be emptied of the coolant. Not only does this revamped system increase the temperature control over the engine operating temperatures, but it saves considerable room in the compressor building and reduces considerably the noise level in the building.

Unit Pump Simplifies Installation



By placing pump, chemical injector, electric motor and motor controls on one unitized skid, the installation of this equipment for hydraulic pumping costs less and construction time is reduced. Field fabrication is always expensive and in this instance time and money were saved by including most of the component parts on a unitized skid.

Once the equipment was so mounted, it could be transported to the field by truck and quickly spotted on a concrete slab foundation. This approach to the installation also makes the job of moving the equipment a simple one, with only a few connections needing to be broken.

By grouping these essential pieces of equipment together, the pumper could easily adjust the pump speed and injection rate of the chemicals. The motor control panel was placed inside a metal cabinet which was welded to the skid. Other parts, such as the motor, gear box and pump, were bolted to reinforcing cross members of the skid. Also included, in this instance, was the chemical storage tank, shown here mounted at the middle of the skid.

Simple Hookup Aids Workovers

A portable pump and a few joints of pipe provide a simple way to kill a well for workovers. The pipe is connected to the bottom of the stock tanks and laid out to a point near the well header where the flow lines tie into the separator. A small portable pump is then set and connected to the line from the tanks. The discharge is connected to the flow line of the well to be killed.

At the well head, the rods and standing valve are pulled, the check

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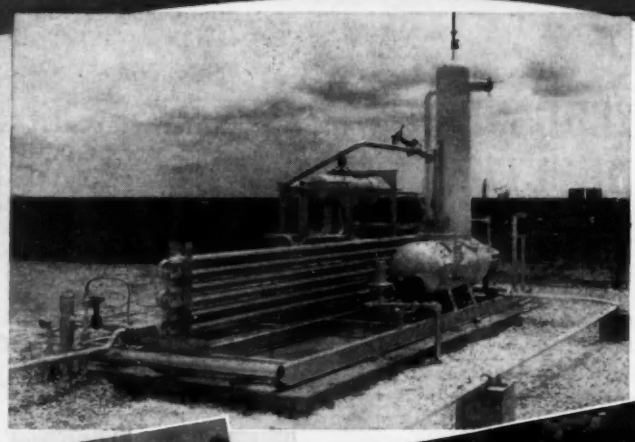

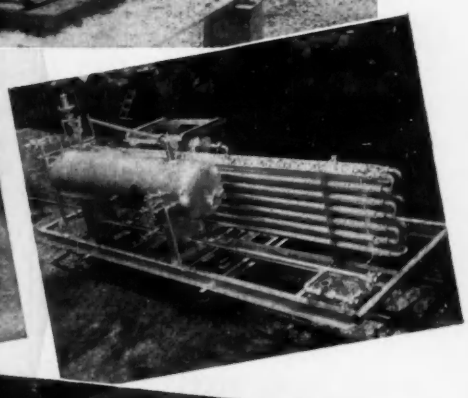

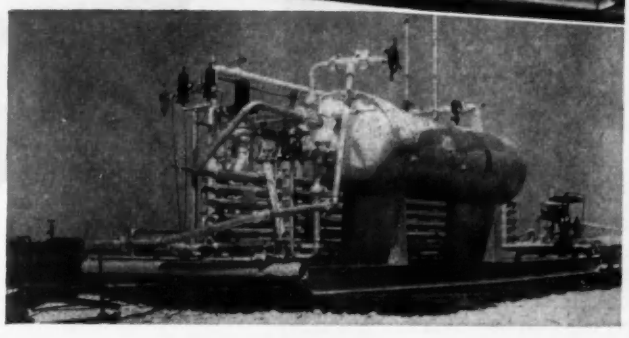

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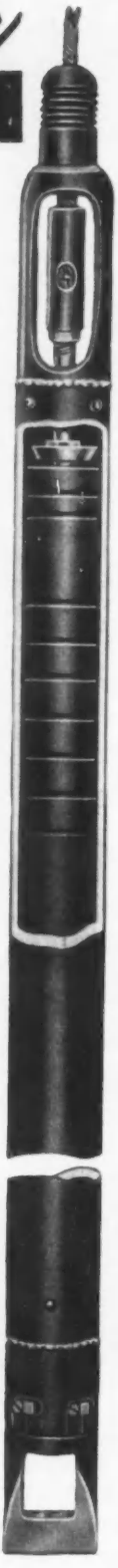

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valve parted, and the flapper removed. This allows oil to be pumped from the tanks directly down the tubing and up the casing to kill the well before the tubing head is removed and the blowout preventer installed.

After the well is killed, it is a simple operation to take up the short suction line and disconnect the hose from the header and install a bull plug where the hose was connected.

This Homemade Jack Centers Well Head

Where polish rod wear is a problem, the tubing head can be centered by two jacks such as the one shown in the foreground. These jacks are placed in two corners of the cellar a few inches below the derrick floor. The nuts are turned on the bolts to move the well head in the desired direction to center the polish rod in the stuffing box. The jacks are placed on the side of the polish rod which shows wear and the nuts run out on the bolts to the point where the polish rod rides the center of the stuffing box when the well is in motion.

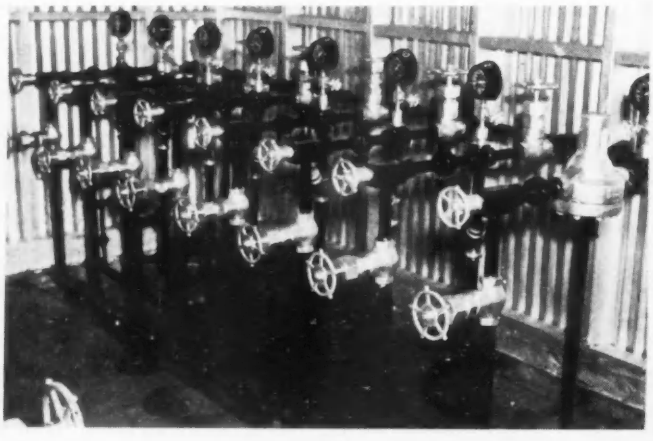
The braces are made from a short

piece of angle iron with a two-inch nipple which is approximately a foot shorter than the distance from the corners to the outside of the well head. The end of the two-inch nipple is welded shut except for a one-inch hole in which a ¾-inch bolt will fit loosely. The threaded end of a bolt is cut off and welded to the side of a thread protector which has been cut in the middle.

With the nut run down all the way, two of the braces are placed inside the cellar and the nuts run out on the threads as described above.

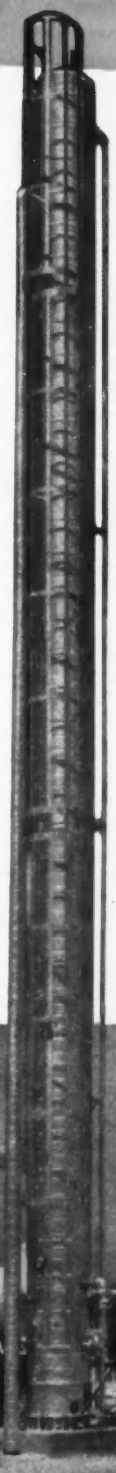
Oil Lines Grouped For Convenience

In the operation of hydraulically powered pumping systems, much can be gained by grouping all the controls on power oil lines together as illustrated. Seven wells are controlled from this single point located inside the pump building on the lease. When the hydraulic pump is discharging a constant volume at a given pressure, the volume and pressure for each well can be controlled by adjustments of the needle valves in this group. By placing the control manifold inside the pump house, the possibility of unauthorized manipulation is minimized and the equipment is protected from the weather. Concrete foundation for the building provides means for a solid support of the valves and piping.



The liquid meter at left is used to gauge the individual volume of power oil sent to any given well in this group. By knowing this volume, the net oil produced from the well can be determined. This factor is ascertained by running periodic tests on each well. The manifolding of power oil piping makes this test simple and the changeover through the meter is done quickly for all pipe is exposed.

Glycol Injection System*
OF LOW TEMPERATURE SEPARATION With STABILIZER**



The Stabilizer is actually a distillation column containing bubble trays. The continuous process of vaporization and condensation that is its operating principle causes the light gases to go off to sales, increasing the BTU value of the sales gas. The medium gases go on to the stock tank where they remain as stable hydrocarbon liquid because the light gases are not present to strip them away. Adding the Stabilizer rounded out Trans-Tex's program for maximum condensate recovery.

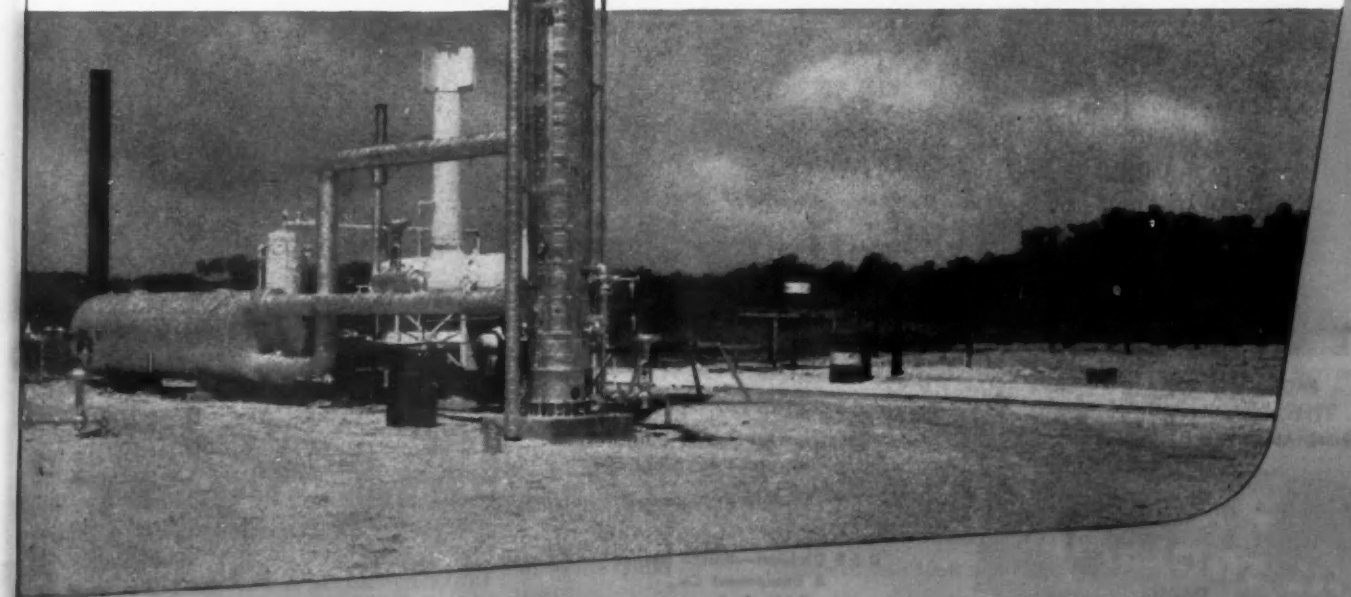
You, too, surely want to get as much condensate as you can out of the gas. And you want to *keep* it! So — why not see what BS&B's COMPLETE condensate-recovery system can do for you?—it may make history — profit history — on your books.

Is the Glycol Injection Unit and the BS&B Stabilizer the Answer to YOUR Recovery Problems?

Answer these questions yourself: Even with very favorable pressure, do you still want added recovery? Do your wells, right now, have the necessary pressure for economical recovery? . . . or is the pressure dropping off? You know that ordinary LTS units should have an available pressure drop of about 1000 p.s.i.—or more. But, even if the pressure drop available is as low as 400 p.s.i. Glycol Injection Units can produce pipeline specification gas and prolong the use of your low temperature separation. With it, you can get increased condensate recovery and dehydrate the gas to pipeline specifications. Actually, what the BS&B Glycol Injection will do answers the question for you.

And, you add, "What about the Stabilizer?" Chances are you're already making 50 barrels of liquid per day . . . or certainly will be on adding the BS&B Glycol Injection System. If so, you'll want to get the most from this increased recovery. . . and to hold what you've made *you need the Stabilizer.* It will pay you dollars to investigate and invest in the Stabilizer.

*Patented **Patent Pending



BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division Department 1-B12

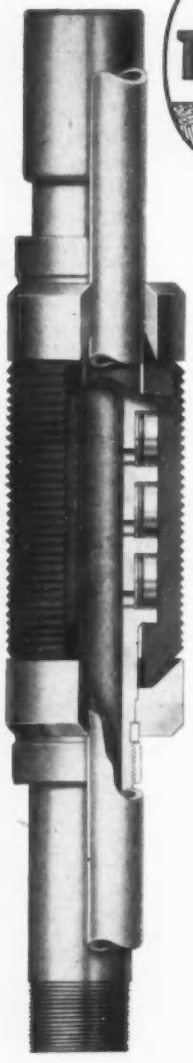
2131 Westwood Blvd. Oklahoma City, Oklahoma

Dual Flow Lines Increase Production

Flow lines connected to the casing and tubing on a high fluid level pumping well offers increases in production. One two-inch flow line is connected to the tubing extending above the well head and the other tied into the casing annulus. Both lines contain check valves to prevent back flow and are tied into a single line near the well as shown. This single line may be closed off by a gate valve placed immediately above the surface where the line goes into the ground.

In completing this pumping well, the tubing is suspended inside the casing and not packed off. Due to a pressure maintenance program, some wells experience relatively high fluid levels, and may occasionally flow of their own accord. However, we are considering a well which is normally a pumper and is operated as such.

Since the line to the casing as well as the flow line connected to the tubing are not restricted in any way, fluids can flow from the well through either or both lines. However, the rods and down-the-hole pump offer some resistance to the flow of oil and water up the tubing, and produced liquids will find relatively less resistance when fluid levels rise and the well flows through the casing annulus. The simplified hookup shown provides the means of equipping this type well for this type of production.



PAGE TYPE "C" TUBING ANCHOR

PAGE TENSION TOOLS

NOTE ...TO "FREE PUMP" OPERATORS!

SMOOTH OUT YOUR TUBING TROUBLES with this PAGE TYPE "C" TUBING ANCHOR...

It's *designed* for parallel strings!

The Page Type "C" Tubing Anchor is designed specifically to anchor parallel strings in "Free Pump" installations. Its advantages to operators are many. The Page Type "C" Anchor *assures* a fast tubing run-in without danger of accidentally setting slips, *eliminates* the human element of top-hole manipulation in setting and *saves* valuable time in landing tubing strings. The Page Type "C" *relieves* tubing of fluid and working pressure loads and *increases* the factor of safety in long tubing strings. It enables running longer strings of second grade tubing because the Type "C" *supports* the tubing and holds it in tension, free of "working" loads.

SIMPLE OPERATION

The Page Type "C" Tubing Anchor sets hydraulically on fluid pressure differential. The hydrostatic head of oil in the power string together with the "free pump" surface operating pressure, forces a series of small pistons against v-cut slip segments that grip securely against the casing. Holding power of the slips far exceeds fluid head and operating pressure loads. Release and removal from well requires only drainage of tubing. Tool can be run-in either end up.

SIMPLE CONSTRUCTION

Anchor Body made from a solid billet of steel . . . working force consists of two v-cut slips and six pressure-sealed pistons . . . all parts replaceable and interchangeable.

WRITE now for details or see . . .

Mid-Continent Distributors

D+B Division—Emsco Derrick & Equipment Co., Garland, Texas

The Continental Supply Company Dallas, Texas

PAGE OIL TOOLS, Inc.
3356 Lime Ave., Long Beach 7, Calif.

Drum Rack Is Hung Below Tank Stairs

Two strips of leftover tank strips can be looped and hooked to the back of the tank steps to make a rack for the chemical drum. This places the drum conveniently near the chemical pump and also near the tanks in case it is necessary to drop chemicals directly into the tanks.

As soon as the tank battery is completed, or when the first well begins

Who really owns Standard?

That old bogeyman—the Tycoon of Big Business—seems still to linger in the minds of some people. Whether or not this was ever a true picture, it is certainly false today. Standard Oil Company of California, for instance, is widely held, independent. It has its own management and shareholders. It is not connected with any of the Standard companies in the East.

The actual owners of Standard Oil Company of California now number 115,942—which is 17,000 more than just two years ago. They include 283 universities and other educational institutions; 236 churches and religious organizations; 1825 small and large businesses; 159 hospitals and other medical groups; 10,876 employees of the Company, and 102,563 other individual citizens, few of whom could be called rich. The great number of our shareholders are people like your own friends and neighbors—yourself, perhaps—mechanics, clerks, farmers, white-collar men, widows, men and women who have retired. ¶ In another sense, of course, the "owners" of Standard are our customers. You *control* the Company by your choice of brands, and you *benefit* by the quality and economy of the products we sell. The only way Standard can look after the interests of its shareholders is by making sure that Standard serves *you* well.

STANDARD OIL COMPANY OF CALIFORNIA ***plans ahead to serve you better***

PUMPING PROBLEM

REDA

MAY HAVE THE *RIGHT* ANSWER

. . . from ⅓ HP to 240 HP . . . from 20 bbls to 17,000 bbls . . . from 200′ to 10,000′ and more . . . Yes, a REDA may do that pumping job BETTER . . .

Reda Pumps are accepted as original equipment, or replacement equipment, because they produce at a lower cost per barrel of fluid. Whether it's large volumes from shallow depths, or modest volumes from great depths, Reda Pumps provide operating savings.

IMPROVED DESIGN:

Constant research and design improvement are responsible for lengthened operating life; corrosion resistance, low labor cost per barrel of fluid produced.

IMPROVED EFFICIENCY:

Greatly improved overall efficiencies have improved Reda performance as much as 25%; a substantial operating saving.

If you have a pumping problem, our engineering staff is always ready to assist you. Phone or write:

REDA

PUMP COMPANY

■

BARTLESVILLE, OKLAHOMA

to show a water cut, the two strips of tank iron are applied. A 90-degree angle is bent in the rods approximately four feet from each end. One end of each rod is bolted to the tank waist-high and the other swung up and connected where it meets the bottom of the tank steps. Since both members are perforated at frequent intervals, it is easy to fiind bolts that match.

The lease truck can be backed up to the tank battery and the drum skidded into the rack. When the chemical level becomes low, a prop can be placed beneath the back of the drum so that it can be drained thoroughly.

Large Drum Lubricates Polish Rod

When wells are at the stage between natural flow and pumping, there are periods of time that the wells flow off a head and then pump to fill up the tubing. During this time there is no liquid against the inside of the stuffing box and the rubbers would soon be burned up if no lubrication were applied.

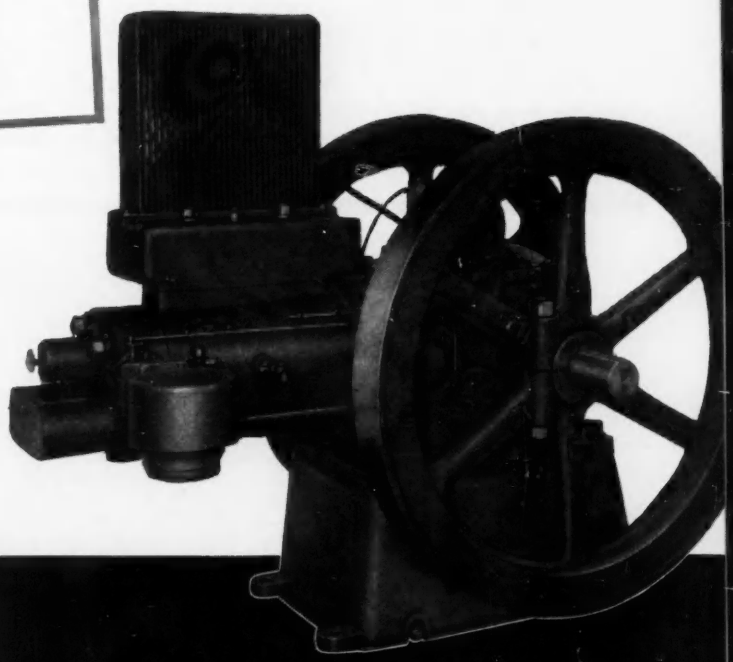
The polish rod may be readily lubricated by placing a grease drum beneath the sampson post of the pumping unit and running a copper tubing over to the stuffing box. The drum is filled with lubricant when the pumper makes his rounds. Where crank case oil is available it is used, and the stream is adjusted to a drop a second. However, water can be used. The water stream must be kept at a higher rate than the oil drop as it must keep the polish rod cool to prevent the rubbers from burning.

The drum is elevated by placing it on another grease drum which is set on boards across the base of the pumping unit. This brings the top of the upper drum on a level with the cross member of the pumping unit, where it is fastened securely.

Clean Out Congested Wells
WITH BURCH AGATE TORPEDOES
Marble blasting pays because marble abrasion is thousands of times greater than sand blasting. It frees oil and gas in the well bore by removing all retarding substances from the true pay formation.
CONDITIONS A WELL BORE OR SHOT HOLE BY RESTORING NATURAL FORMATION.
ABRASION REAMING THE WALL CONTOUR DEEPER THAN RETARDMENT.
EXPLOSIVE-DRIVEN GLASS MARBLES STRIKE THE WALLS WHOLE AND IN A UNIFORM PATTERN.
242 PER LINEAL FOOT OF HOLE.
EACH MARBLE PENETRATES THE WALL SURFACE AND THEN BURSTS EXPLOSIVELY.
DESIRED COLUMN TO COVER PAY IN ONE RUNNING CAN BE MADE WITH 5′ SECTIONS.
Explosive
Well bore cross section. Dotted lines indicate wall reaming.
SIMPLE ● IMMEDIATE ● ECONOMICAL
Cross section view of torpedo
BURCH Agate Torpedo
CALL YOUR OWN SHOOTER
BORGER, TEXAS

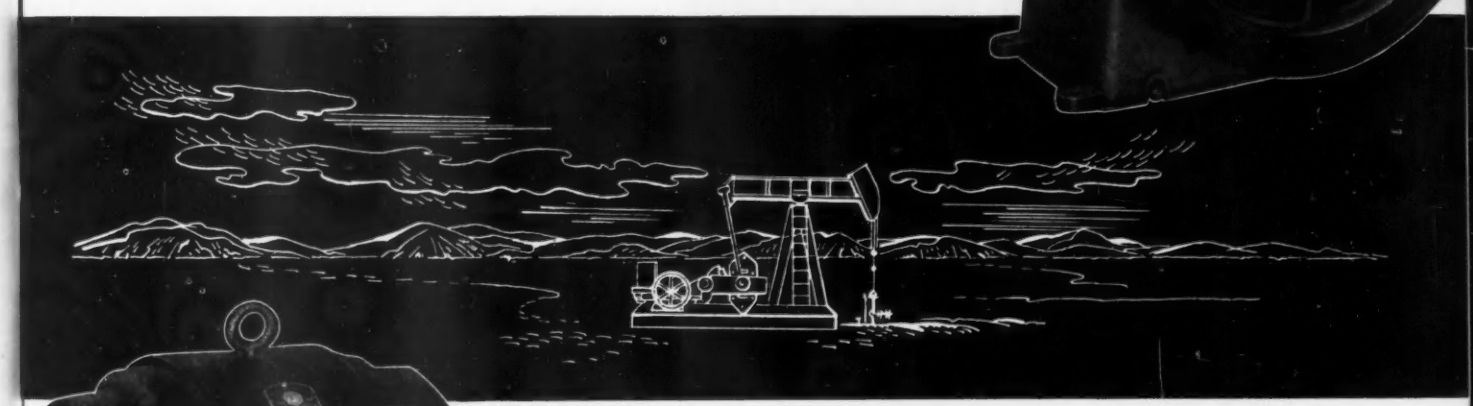
For Oil Well Pumping

FAIRBANKS-MORSE
serves you best!



If you choose engines,

the famous Fairbanks-Morse "ZC" is your best choice for economical, efficient service. The big, *extra* heavy flywheels of the "ZC" assure considerable savings in gas or gasoline . . . protect engine and driven equipment against excessive wear. The simple, rugged, single-cylinder "ZC" design means easy maintenance . . . no complicated parts to cause trouble.



If you choose motors,

the Fairbanks-Morse General Purpose Motor is your choice for stand-out . . . stand-up performance. Check the exclusive, indestructible "Copperspun Rotor" . . . unique cross-flow ventilation . . . protected, one-piece cast frame and it's easy to see why they are tops for the heavy starting loads and long-period, peak-capacity operation of oil field service.

And, remember,

since Fairbanks-Morse manufactures both motors and engines, we are able to recommend, without prejudice, the exact power choice that will serve your pumping needs best. Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

FAIRBANKS-MORSE

a name worth remembering when you want the best

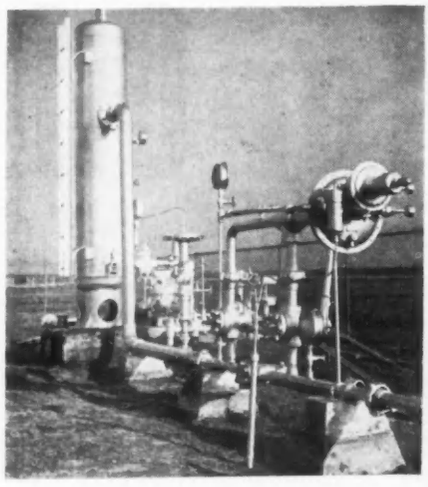
OIL FIELD EQUIPMENT • PUMPS • SCALES • ELECTRIC MOTORS • GENERATORS • LIGHT PLANTS • DIESEL, DUAL FUEL & GASOLINE ENGINES • MAGNETOS • DIESEL LOCOMOTIVES

Gas Well Used As Compresor Standby

To insure an adequate supply of natural gas for a pressure maintenance program, a high-pressure gas well can be tied into the compressors should field wells be shut down. In one special case, one well in the field is a high-pressure gas well with a shut in pressure of about 600 pounds. The small pressure maintenance project operates at about 750 pounds. Low-pressure gas taken off the field separators is piped into the suction of the low pressure section of a compressor. The gas is compressed to 750 pounds in two stages, the first stage discharged at 325 pounds.

In order to keep the gas flowing constantly into the gas cap to maintain reservoir pressure, and to eliminate compressor plant shut-downs, this high-pressure gas well is connected to the compressor plant between the two stages of compression.

Heavy-duty two-inch line carries the gas to a high-pressure separator located at the station site. The discharge from the separator contains a pressure regulator and bypass connection. This regulator is controlled by the first stage discharge pressure. In the event that gas production in the field drops and the discharge pressure from the first stage of compression is lowered below about 300 pounds, this regulator opens to allow high-pressure gas at about 325 pounds to flow into the suction of the second stage of compression. In this manner, the compressors continue to operate and gas is injected continuously into the gas cap.



JENSENS for those remote locations

A JENSEN Pumping Unit does a good job no matter where it is located. But certain JENSEN features make them especially good equipment for those remote locations far removed from service facilities.

For example, with the new Jensen Gear Reducer it is a simple in-the-field job to change from single to double reduction, or double to single. Almost any adjustment or service can be handled by one man. But most important of all is the long trouble-free service life that is built into each JENSEN Unit.

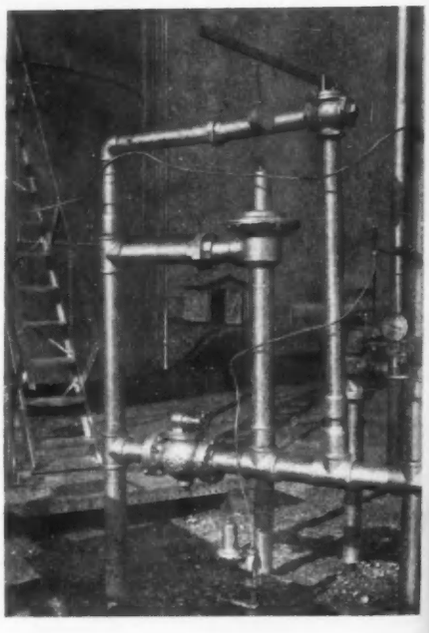
Whether your wells are far or near, deep or shallow—there's a JENSEN to do the job BETTER and CHEAPER. Invite us to prove it!

JENSEN

BROS. MFG. CO., INC.

Coffeyville, Kansas, U.S.A.

EXPORT OFFICE: 50 CHURCH STREET, NEW YORK CITY



Treater Guarded By Valve Release

A triple valve hookup can be used on a heater-treater to insure pressure release of back-pressure valves in the gas discharge line. Usually, heater-treaters operate on about 25 pounds per-square-inch or less back pressure which is sufficient to kick the fluids out of the treater. These are not

BEAIRD
Ingersoll-Rand

Packaged Compressor Plant

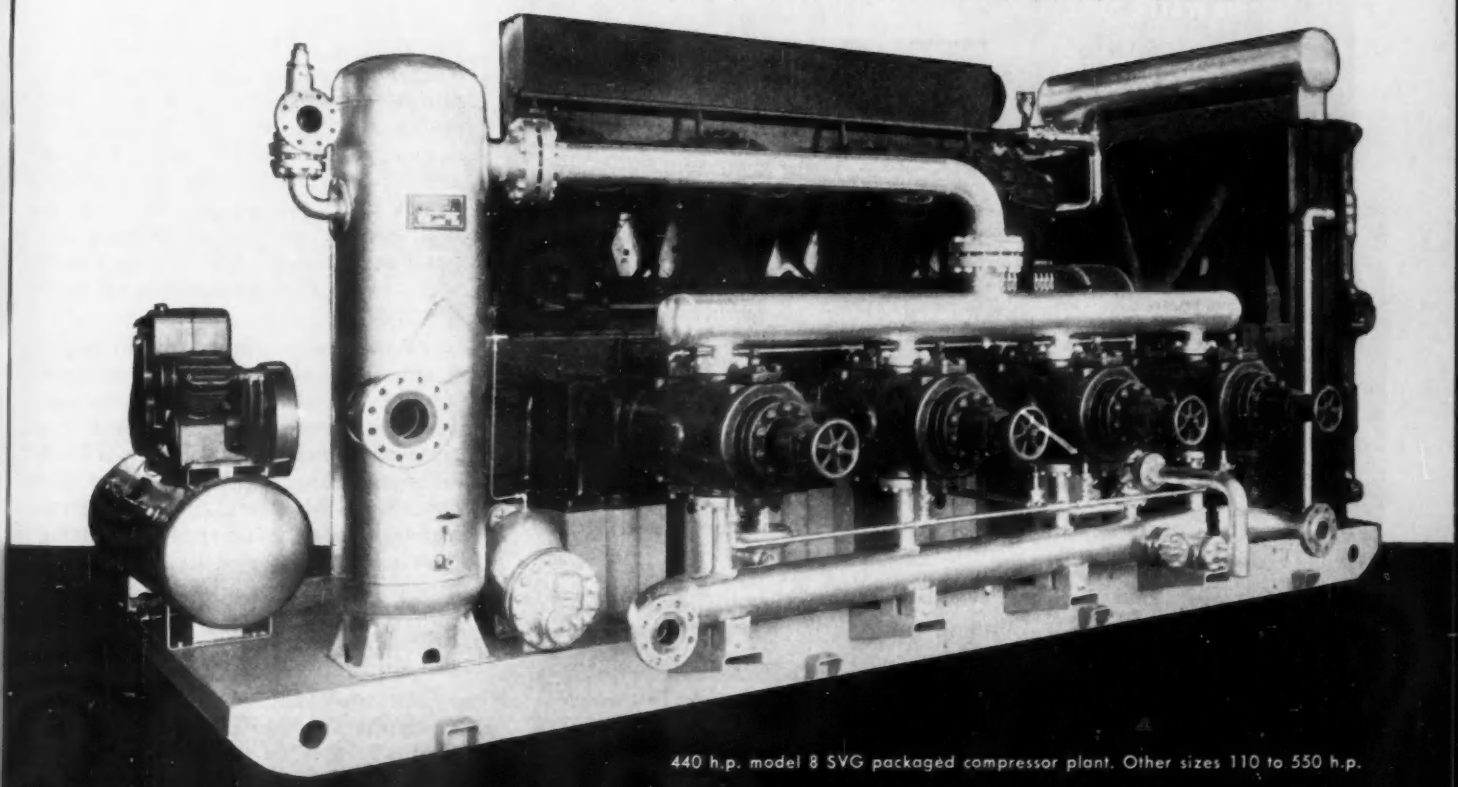
How Complete Packaging saved over 30% on installation cost of one compressor station

Actual comparative costs were made recently between a packaged compressor installation and a permanent type installation, for repressuring service in a Southwest field. With a requirement of approximately 3,000 horsepower, it was found that Beaird-Ingersoll-Rand packaged compressor plants could be installed for 30% less than the cost of a permanent compressor station.

The saving is achieved by centralized purchasing, fabricating and complete assembly at the factory, rather than by use of expensive field assembly. The cost of housing for operators was also avoided because automatic controls on the packaged units made regular attendants unnecessary.

An added economy will be afforded by packaged units in the future when the plant is expanded. The capacity of the plant may be increased by simply installing additional Beaird-Ingersoll-Rand packaged compressor plants, without expensive remodeling of the entire station.

Write for information on the economy of complete packaging.



440 h.p. model 8 SVG packaged compressor plant. Other sizes 110 to 550 h.p.

OWEST COST PER HORSEPOWER, INSTALLED

SINCE 1918
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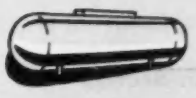
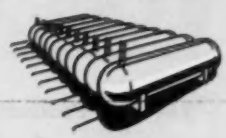
THE J. B. BEAIRD COMPANY, INC. Shreveport, Louisiana

L P GAS SYSTEMS

CAST STEEL FITTINGS



ANHYDROUS AMMONIA EQUIPMENT



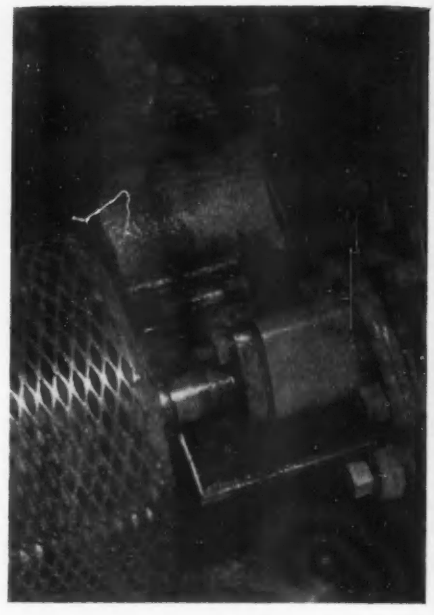
PRESSURE BULK STORAGE

high-pressure vessels, and excessive pressure must not be exerted on them without a possible disaster.

To provide triple insurance against one back-pressure valve sticking, three are installed on the gas discharge line from the treater. Two of the valves are weight loaded, as shown. The intermediate valve is spring loaded.

The three-inch gas discharge line extends out of the ground and is connected into a horizontal run about two feet above ground level. A tee carries a riser to which are attached two other lines, both equipped with back-pressure regulator. All valves discharge into the same horizontal section as shown. The bottom valve is set to maintain about 18 pounds back pressure. Should this valve fail to open, the middle valve is set to open about 20 pounds, and the top valve would open at 25 pounds. This hookup represents a simple arrangement of fittings and valves to provide the insurance necessary.

Another feature offered by this installation is high gas production. When the gas oil ratio increases, and the restriction in the lower valve causes more than an 18 pound back pressure, the other valves will open to reduce the differential across the valves to the safe operating level of the heater-treater.

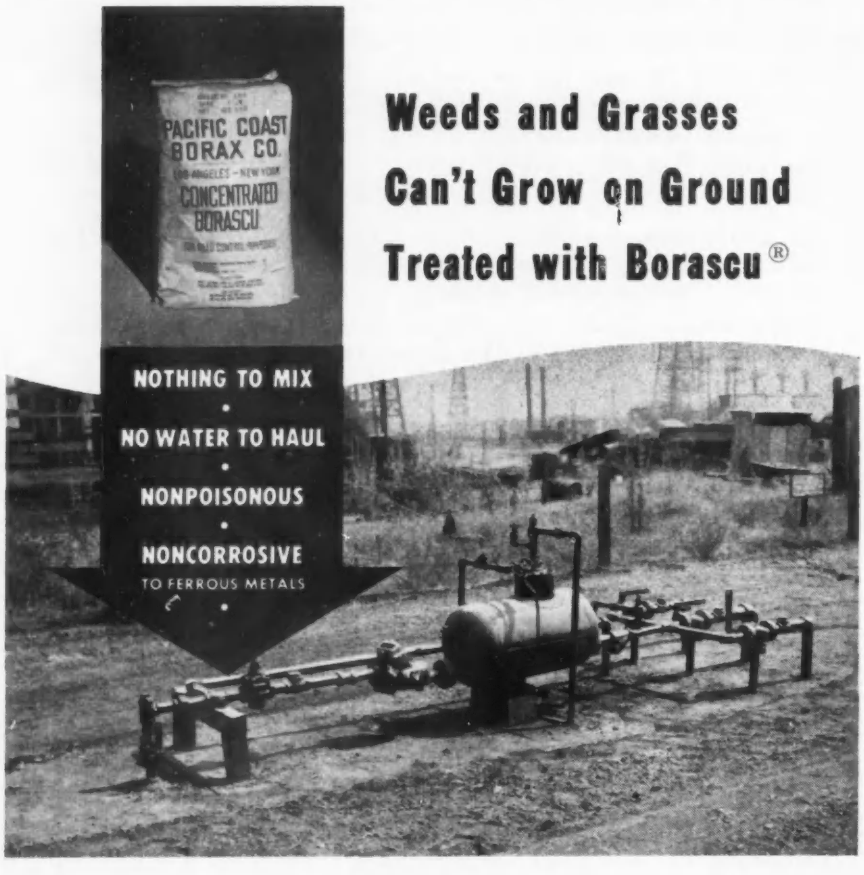


Oil Guard Checks Leak Around Packing

A shop-made oil guard prevents the slinging of leaking oil from the base of a packing gland on a rotary pump. On remote operated gear pumps that are electrically driven it is nearly impossible to stop oil leaks around the fast-turning drive shaft. When these pumps are running at high speeds, an oil leak around the packing gland of the drive shaft will cover the pump house with sprayed oil.

To eliminate this condition make a small steel cover to fit snuggly around the stuffing box as shown. It consists essentially of a short section of six-inch pipe, split down both sides and hinged along one of the split edges. Matching split end pieces are welded to each section, fitting closely around the shaft at one end and around the stuffing box at the other. One of these flanged ends is drilled so that it can be bolted to the stuffing box for firm support.

The top half of the split pipe is equipped at either edge with a small channel grove so that when the two sections, placed together, form a tongue and groove joint. This joint prevents the leaking oil from being splashed out of the cover. The top section is heavy enough to keep it in place when closed so that it does not have to be bolted or latched. A drain hole at the bottom carries any leaking oil to a sump below the pump.



Weeds and Grasses Can't Grow on Ground Treated with Borascu®

.....a single application of Borascu Weed Killer may keep an area cleared for 1 or 2 years!

Where ground must be kept bare of all fire-hazardous weeds and grasses... that's the place for BORASCU! This weed killer gives long-lasting results because it goes into the soil, and remains there, where it can destroy plant life, *roots included!* Economy-minded production men like BORASCU; figure it saves up to 80% of former "grassing" costs... and it's safe, nonflammable, easy to use. Write for literature.

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PACIFIC COAST BORAX CO.

DIVISION OF BORAX CONSOLIDATED, LIMITED

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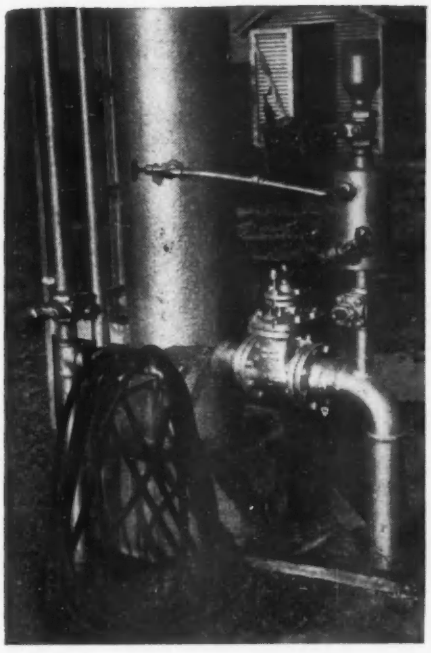


Lubricator Adds Chemicals to Water

A conventional lubricator is a simple method of adding treating chemicals to the cooling water used to cool compressor engines at small pressure maintenance plants. Instead of employing radiators, a cooling tower is substituted at a substantial advantage. Water used to maintain engine temperature at desired levels is pumped by means of a belt-driven centrifugal pump through the engine water jackets and back into a vertical section of 20-inch casing that serves as a cooling tower.

Purpose of the vertical tower in addition to providing some cooling, is to place upon the suction of the centrifugal circulating pump a 20-foot head of pressure. This insures circulation without a loss of prime in the pump.

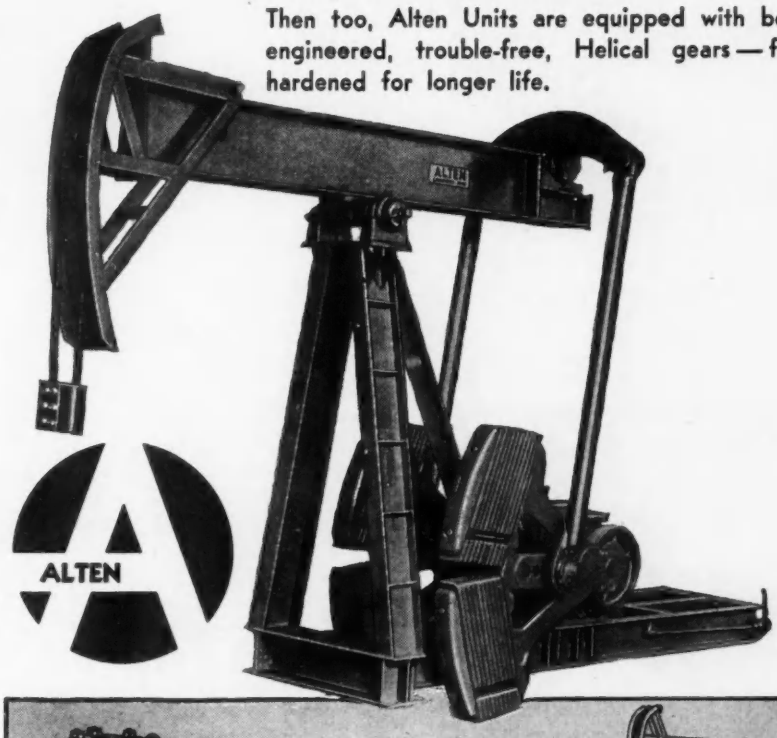
Shown is the discharge piping from the tower leading into the suction of the centrifugal pump located at the engine. In the reducing ell where the line goes into the ground, a collar is added to support the chemical water treating lubricator. This 1½-inch line contains a plug valve that controls the flow of chemicals into the water stream to control scaling and corrosion.

The lubricator is a short section of eight-inch pipe welded close at both ends. The top end is equipped with a fill nipple containing a gate valve. The equalizing line is tied into the lower part of the tower. A ¾-inch nipple welded to the lower part of the lubricator serves as a drain and cleanout line. In operation, the equalizing line is shut in, the feed line is closed and the fillup line opened.

ALTEN pre-testing means much to you

★ More fluid . . . uninterrupted operation . . . lower maintenance costs. You get them all with Alten Pumpers because each must prove itself in severe factory tests before shipment.

Then too, Alten Units are equipped with better engineered, trouble-free, Helical gears — flame hardened for longer life.



YOU GET THESE ADVANTAGES WITH ALTEN HELICAL GEARS:

EXTREMELY ACCURATE GEAR TEETH
Continuous direction of hob results in cutting accuracy beyond that obtainable from the shaper process which produces herringbone gears.

REDUCED SHOCK LOAD
Impact or backlash loads are 10 to 20% lower than those on herringbone gears because Helix angles are 50% lower.

MAINTAIN PERFECT TOOTH PROFILE
Because Helical Gears have no unflexing centers, stress is evenly distributed over entire face of gear teeth. Tooth profiles are permanently retained.

FLAME HARDENED TEETH
Gears are precision cut from finest alloy steel and shaved for perfect profile then flame hardened for highest surface hardness obtainable.

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Foundry & Machine Works, Inc.
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OUTSTANDING PERFORMANCE

SAND-BANUM SPECIAL

TABLETS REMOVE AND PREVENT RUST AND SCALE IN ALL RADIATOR COOLING SYSTEMS

Clean Cooling Systems Do More At Less Cost

SAND-BANUM

REMOVES AND PREVENTS BOILER SCALE AND CORROSION

Ounces Only Once A Week give a new operating efficiency and economy.

Don't Be Satisfied With Less

Stocked by Leading Supply Houses

AMERICAN SAND-BANUM CO.

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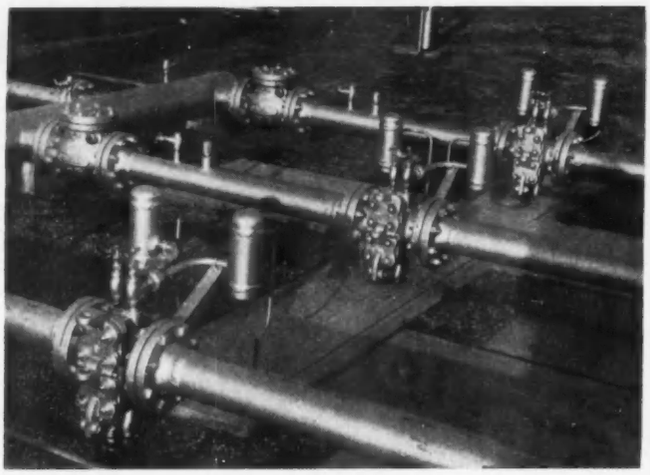
Prefab Drips Knock Out Moisture



Prefabricated drips can be installed at the orifice plate fittings on the instrument lines connected into 24-hour pressure recorders. The installation shown incorporates several features that add to efficiency of operation and neatness in appearance.

To prevent moisture from entering the pressure recorders on three main supply lines, small four-inch, capped drips are placed at the orifice plate holders. In this manner, all moisture is removed before the gas enters the line leading to the recorders.

Each drip is made with a ¾-inch inlet line that is fitted with a union to permit easy connecting and disassembly. The outlet line, of ½-inch tubing, also contains a union. This outlet line that carries pressure to the chart recorder, is laid in a concrete ditch covered with removable steel plates. Such construction eliminates stumbling hazards, improves the appearance, and reduces chances of breaking these small, fragile lines should they be placed above ground.

A short section of angle iron is used as a supporting member for each drip unit. These supports are bolted to one of the orifice plate holder flange bolts as shown. The drip is mounted to this angle iron by a U-bolt that clamps to the ¾-inch inlet line.

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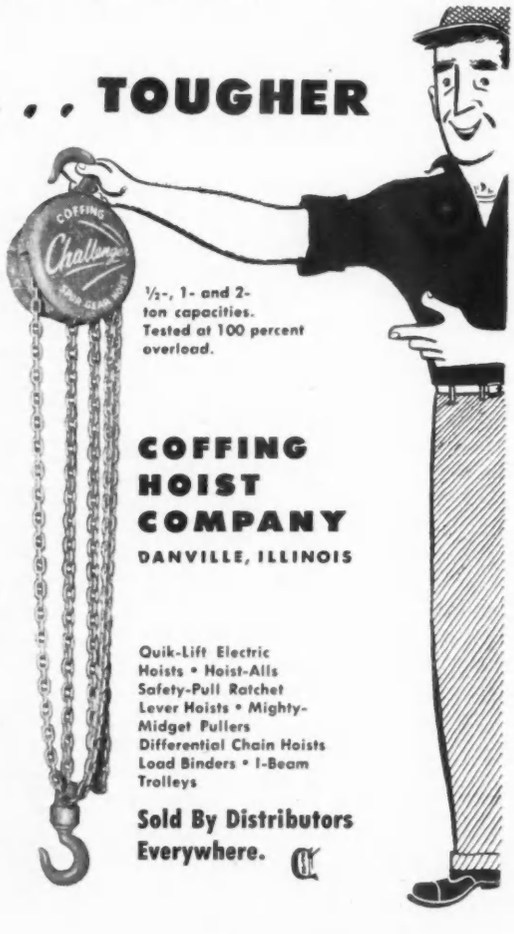

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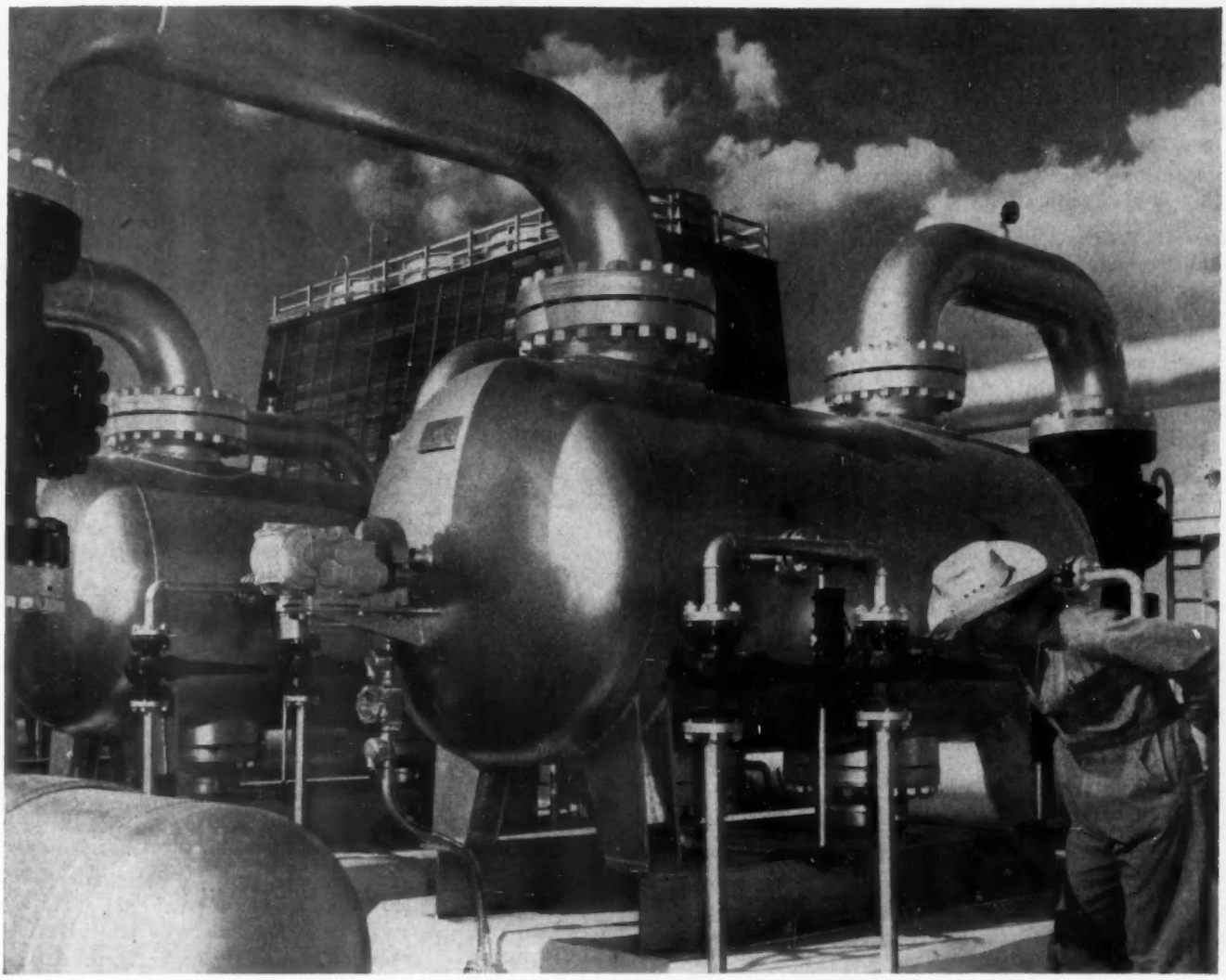


Horizontal separator-scrubber installation. Note motor at left which turns rotating element inside vessel.

New Separator-Scrubbers Show Good Results

Horizontal unit removes dust and distillate from gas stream and protects compressors from abrasion.

By BEN R. KELLER, Tennessee Gas Transmission Company

More than 50 of a comparatively new type of horizontal natural gas separator-scrubbers have been in service on the transmission system of the Tennessee Gas Transmission Company more than one year, with encouraging results from the standpoint of liquid and dust removed.

If indicated increase in efficiency shown for this new scrubber during the year are borne out by operations with more units over a longer test period, it may have a claim to be listed among outstanding recent developments in gas transmission equipment.

Exhaustive tests indicate the separator-scrubber removes high percentages of dust from the gas stream. In some locations, the indication is that only quantities of dust so small that measurement is extremely difficult pass through the scrubber.

Lube oil and condensate which have been hitching "free rides" down the pipe line at the expense of reduced gas flow capacity likewise are captured in quantity. This capture results in double savings:

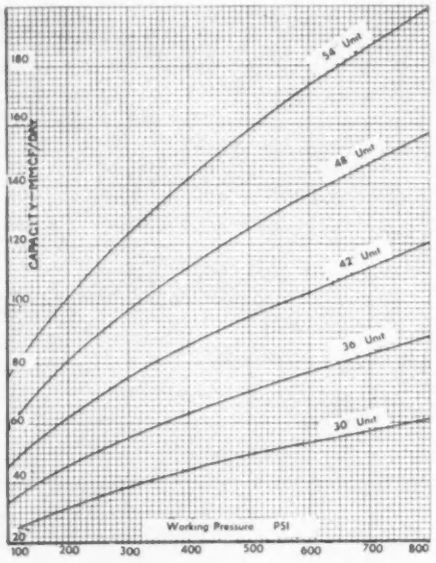
- Most of the scrubbers have been

found to recover a surplus of oil or condensate from the gas stream, saving the cost of purchasing scrubber oil which otherwise would be required.

• With removal of the liquids, compressor cylinder maintenance expense is also reduced.

How It Works. The scrubbers are small, compared to most other types commonly used in industry. A unit sized to handle 120 million standard cubic feet of gas per day at 450 pounds per square inch is four feet in diameter and slightly more than 10 feet long. This size makes for ease in handling and setting.

The separator-scrubber vessel is divided into two main sections. The first section is a high capacity separator equipped with large capacity mist extractors. If large quantities of liquids are present in the gas, they tend to drop out at this point. When quantities of liquid are sizable, the vessel is equipped with an automatic trap or dump valve to control the level of accumulated liquid. Dust removal in this inlet section of the scrubber is incidental.



Capacities of horizontal scrubbers by diameters. Capacities are based on 0.60 specific gravity gas.

The second section of the scrubber removes dust. The heart of the unit is a scrubbing element made of corrugated cylinders, concentrically arranged around a 16-inch drum mounted on a rotating shaft. This element is rotated by an electric motor mounted on a bracket outside the vessel. As it turns at a very slow rate of speed it passes through an oil bath which fills the lower third portion of the vessel. The corrugated cylinders are filmed with a coat of oil during this rotation. They present an oil wetted labyrinth to the gas traversing the cylinders, and dust tends to stick to the individual cylinders. The dust particles find their way to bottom of the vessel, when the spaces between individual cylinders are flushed clean once each revolution.

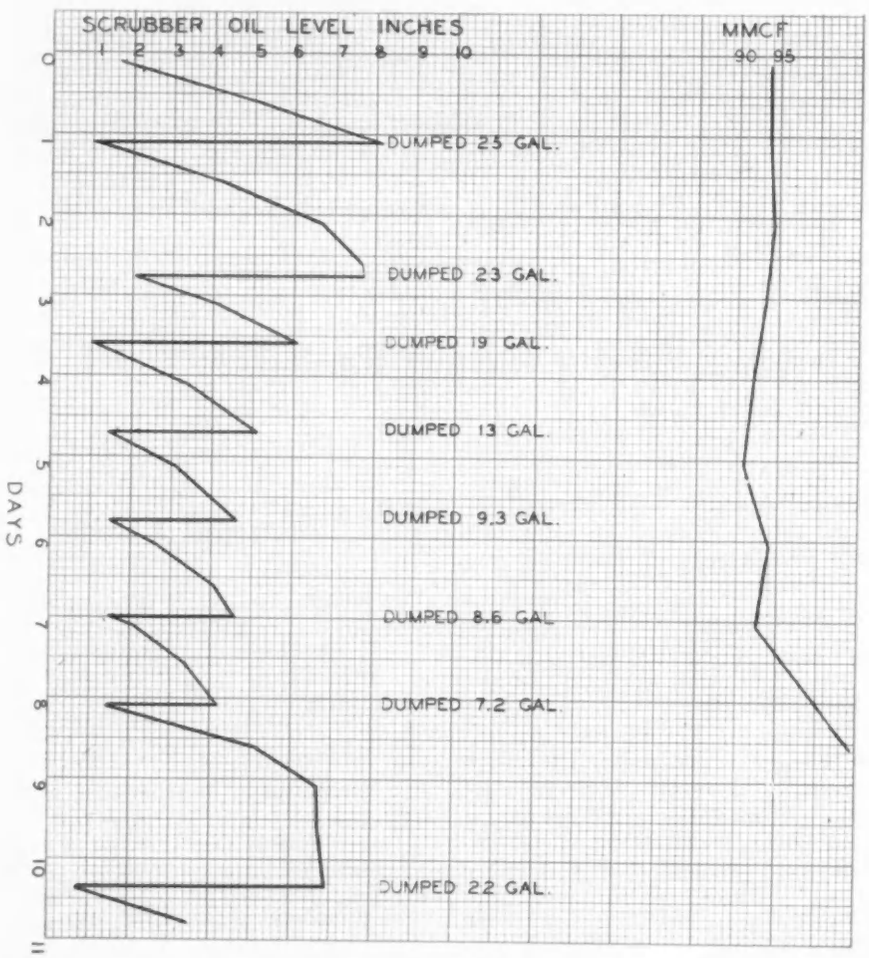
This core of corrugated cylinders is actually composed of about 40 cylinders two feet in length, mounted concentrically on a blinded pipe hub with the space between the individual cylinders being less than one inch.

Another main feature of the second section of the scrubber is a mist extractor. It is designed to capture oil entrained by the steam passing through the upper portion of the rotating element. It accounts for the small scrubber oil loss and for a portion of the overall gain where there is one.

A solid decking of metal covers the surface of scrubbing oil so far as is practical. This was installed to counter oil loss experienced with early models of the scrubber. The loss was occasioned by oil spouts which formed at intervals near the outlet pipe of the vessel. This spout was caused by the sudden change in velocity of gas passing through the scrubber at four feet per second and accelerating to 32 feet per second at the outlet piping.

This cause of oil loss was discovered only after the manufacturer had constructed a full scale scrubber with glass viewing windows in the side and ends. Observation proved that a vortex formed, lifting a small amount of oil from the vessel. When the exposed surface of the oil was covered, this difficulty was overcome.

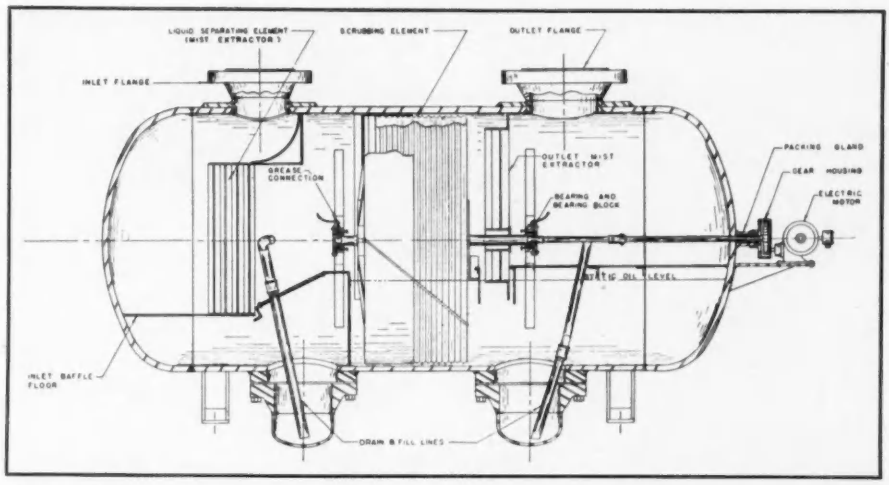
Scrubber Operations. Tennessee Gas has had models of this scrubber in use for more than two years. One of the large compressor stations has been completely equipped with this type scrubber during the past year. On the suction side of the plant, 16 horizontal separator-scrubbers are handling about 1300 MMSCF/D. They are not only doing a satisfac-



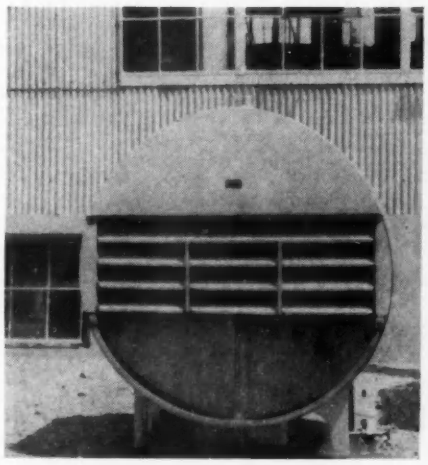
Curves demonstrating liquid recovery of scrubber. Three of TGT's compressor stations, partially or fully equipped with these scrubbers, captured 454 barrels of distillate in three months.

About the Author

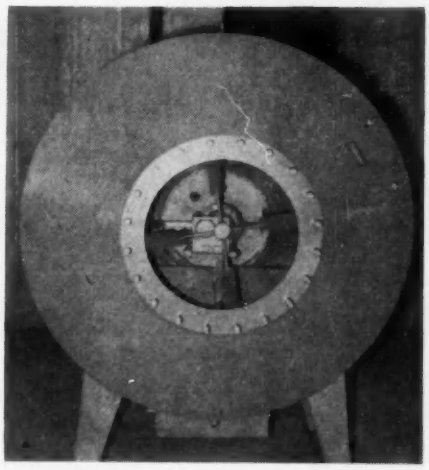
BEN R. KELLER who heads the mechanical engineering section of TGT's engineering department has been with the company since 1943. He started as draftsman, then moved to the field to supervise construction of a number of dehydration plants and compressor stations. In 1949 he returned to the drafting department as chief draftsman. In 1951 he advanced to his present position. Prior to joining TGT, Keller worked as a driller on both rotary and cable tool drilling rigs in Gulf Coast and West Texas fields.



Drawing of the unit. The scrubbing element is composed of corrugated concentric drums mounted on a 16-inch hub.



Scrubbing element mounted in air intake cleaner for gas engines. Tests have revealed that little or no dust can pass this element.



Back view of air cleaning unit. Power for rotating drums comes from blades.

tory job in removing dust from gas coming into the 40,000 horsepower compressor station, but they are also capturing large quantities of fluid from the stream. The bulk of the fluid is composed of compressor lube oil and distillate from upstream.

During three months of summer operation, a compressor station with 16 horizontal scrubbers recovered 4553 gallons of fluid from suction gas. The bulk of this captured fluid is distillate. This was the only type scrubber in operation at the station.

Another station's record for three months showed a gain of 3604 gallons of distillate for the horizontal separator-scrubbers. During this same period, conventional scrubbers at the same station showed a loss of 2026 gallons of scrubber oil.

Three of Tennessee Gas' stations which are partially or fully equipped with the horizontal scrubbers recovered 454 barrels of distillate from the gas stream in three months of summer operation. Careful studies have proved that this recovery can be credited to the scrubber operation—and not to lowered temperature due to pressure drop across the scrubber. The pressure drop across the element is about four inches of water.

Tennessee Gas uses distillate for charging the scrubbers. Since the gas to be scrubbed contains heavy hydrocarbons in sufficient quantities to condense in the line in cool weather, the condensed distillate drained from the separator section of the vessel makes a satisfactory scrubbing medium. Actually the gas passing through the scrubber is close to being saturated with the hydrocarbons of the scrubbing agent.

Where gas has had hydrocarbons removed, it is advisable to use mineral seal oil or a light grade lube oil.

With little or no change, the rotating scrubbing element has been adapted to cleaning of intake air for internal combustion engines. And its performance in this service gives an indication of its performance inside a gas scrubber. Here's an example:

The scrubbing element was mounted in an air cleaner on the scavenging air intake on a 1000 horsepower gas engine. It was assumed that an analysis of the carbon deposits in the exhaust manifold and the stacks would give an indication of the amount of dust which was passing through the oil-wetted labyrinth presented by the scrubbing element.

Prior to the test the exhaust manifold and stacks of the engine were mechanically cleaned of carbon deposits. Then the engine was placed in operation for one year. At the end of this time carbon deposits were scraped from the exhaust manifold and piping and analyzed. Tests showed that silicates made up less than one percent of the residue.

Meanwhile nearby engines showed an analysis of 15 to 28 percent silicates in the carbon deposits.

In theory, and thus far in practice, the scrubbing element should operate more efficiently inside a separator-scrubber than in an air cleaner. This is especially true, if the separator element in the inlet side of the vessel is recovering distillate or lube oil, since it will be presenting additional areas of wetted surface to the gas stream, and should capture additional dust.

Photo courtesy Bechtel Corporation

With completion next fall of the Trans Mountain 24-inch, 711-mile crude line to Vancouver, Canada will have completed the first coast-to-coast pipe line system on the continent. Scheduled to have an initial throughput of 75,000 barrels daily, the line is slated to start with initial capacity of 120,000 barrels. Here, crew is lining up pipe in trench near McMurphy, B. C.

Call Answered for More Canadian Pipe Lines

Nine in operation before 1952, four more completed this year, permit requests fly thick and fast for the future.

By BOB SHIELS, Oil Editor
The Journal, Edmonton

As WESTERN CANADA's known petroleum and natural gas reserves increase and as the demand for these products rises across Canada and the U. S., the need for more miles of pipe line to move oil and gas to market is playing an increasing role in determining the nature of industrial growth in the prairie provinces, particularly Alberta.

When Westcoast Transmission Company was granted a permit by the Alberta government to build a gas pipe line from northwestern Alberta to the west coast, the search for gas in the area where supply was to come from reached unprecedented intensity. Crude production in Alberta is tied to the market demand, and fluctuates with the operations of the Interprovincial pipe line to the Great Lakes. Completion of Trans Mountain oil pipe line to the west coast will provide an important new outlet.

Canadian oil requirements in 1952 passed the 450,000-barrel-a-day mark, divided as follows: British Columbia, 54,100 barrels; prairie provinces, 97,600 barrels; Ontario and Quebec, 261,300 barrels, and the Maritimes and Newfoundland, 42,200 barrels. Alberta can produce 275,000 barrels daily, if market outlets are available.

Alberta's current oil reserves have increased 23 times from the known reserves six years ago of 72,000 barrels. In 1952 the total was 1,692,000 barrels. Pipe lines are being built to move these increasing reserves from well-sites to the refineries, and to transport petroleum products to market.

Growing with other phases of the western Canadian oil industry, pipe line mileage has increased rapidly since pre-war years. In 1939, Canada boasted of 182 miles of trunk crude and product lines. By 1948 mileage had reached 455. But in 1952 there were 2448 miles of main transmission lines in Canada, and it was estimated the total will increase to around 3150 miles in 1953.

Addressing the Canadian Club of New York, John R. White, executive vice president of Imperial Oil, Ltd., Canadian subsidiary of Standard Oil Company (N. J.), said the world's first transcontinental oil transport system is shaping up in Canada.

The crude pipe line now being built to the west coast, together with crude and product lines east of the Rockies, White said, could be utilized in emergencies to ship Canadian oil to either coast. Canadians, he said, will have bridged the gaps in North America's oil structure.

Major oil and gas transmission lines built in Alberta prior to 1952 included:

- Canadian Western Natural Gas Company's system serving Calgary.
- Northwestern Utilities Ltd. system serving Edmonton.
- Interprovincial pine line.
- Montreal-Portland.
- Imperial pipe line.
- Winnipeg pipe line.
- A gas line to Montana.
- Valley pipe line.
- A line built by Texaco Exploration Company to serve the fast-

growing Wizard Lake-Bonnie Glen field of central Alberta.

Canadian Western Natural Gas Company, commonly called Calgary Gas Company, pioneered pipe line construction in Canada and North America. The company's first gas transmission line, built in 1912, was a 170-mile, 16-inch line from the Bow Island gas field in southern Alberta west and north into Calgary.

In 1924, a 30-mile stretch of 10-inch pipe was built south from Bow Island to tap another gas source at Foremost. Branch lines built during that period still service Lethbridge, Fort MacLeod, Claresholm, and High River.

Canadian Western's major source of gas now is Turner Valley. A six-inch line from Turner Valley tied in with the original Bow Island line in 1921. A 10-inch line was built directly into Calgary in 1925, and three years later a 14-inch line was added. Gathering lines and looping form a network leading into the city.

With discovery of the highly-productive Jumping Pound gas field 28 miles west of Calgary, a 12-inch line to the city was constructed in the winter of 1950. The next year, an extension was built to serve the resort town of Banff. Eight-inch pipe runs from Jumping Pound 30 miles west to Exshaw, and six-inch pipe from Exshaw to Banff.

Canadian Western was one of the first companies in North America to introduce the principle of storing gas in the ground during periods of light demand. A storage plant was started at Bow Island in 1930 when the field was nearly depleted. Now, gas moved from Turner Valley is stored in the summer to be used during periods of peak demand in the winter.

In 1951, the Canadian Western system handled a peak 24-hour load of 150 MMCF, of which Turner Valley provided 95 MMCF. Connected with the company's system are 254 oil and gas producers and 87 gas wells at Turner Valley, 14 gas wells at Bow Island, five at Foremost and five major gas producers at Jumping Pound.

A separate Canadian Western system serves the town of Brooks, east of Calgary. Total mileage of pipe lines operated is 429, including 65 miles of branch lines. The company's major customers are oil refiners, power plants, cement, sugar and explosive plants, and householders at Calgary, Lethbridge and intermediate points.

Northwestern Utilities Ltd., the Edmonton gas company, began operations in 1923 with a line. 10-inch on the eastern half and 12-inch on the west, along a 78-mile route in a general northwesterly direction from the big Viking-Kinsella gas field into Edmonton.

Trenching operations make start of another spread, in the Acheson area several miles west of Edmonton on Trans Mountain's 24-inch crude line which will deliver central Alberta crude to to Pacific coast refining centers.

Looping was started until a 12-inch line was added between 1929 and 1943. Between 1945 and 1949, a 16-inch third line was added. Fifty-nine miles of a fourth line being built west from the Viking field had been completed by the end of 1952.

Northeasterly from Holden, on the main transmission route, the first extension, 20 miles of four-inch pipe, was built in 1940 to serve the town of Vegreville. A major transmission line swinging southwesterly to the central Alberta town of Red Deer was built in 1946. Serving the towns of Camrose and Wetaskiwin en route, the 100-mile extension consists of 70 miles of main transmission line and 30 miles of six-inch branch lines.

In 1950 Northwestern built a 22-mile eight-inch line from the Leduc field to Edmonton. Designed to conserve Leduc natural gas, the line provides a market for gas turned out in conjunction with the area's oil production.

Also in 1950, the company constructed a system of 12-, 8- and 6-inch pipe lines to serve the towns of Fort Saskatchewan, Namao and St. Albert north, northwest and northeast of Edmonton. In 1951 a 17-mile eight-inch extension was constructed southeasterly from the Viking field to a military camp at the town of Wainwright.

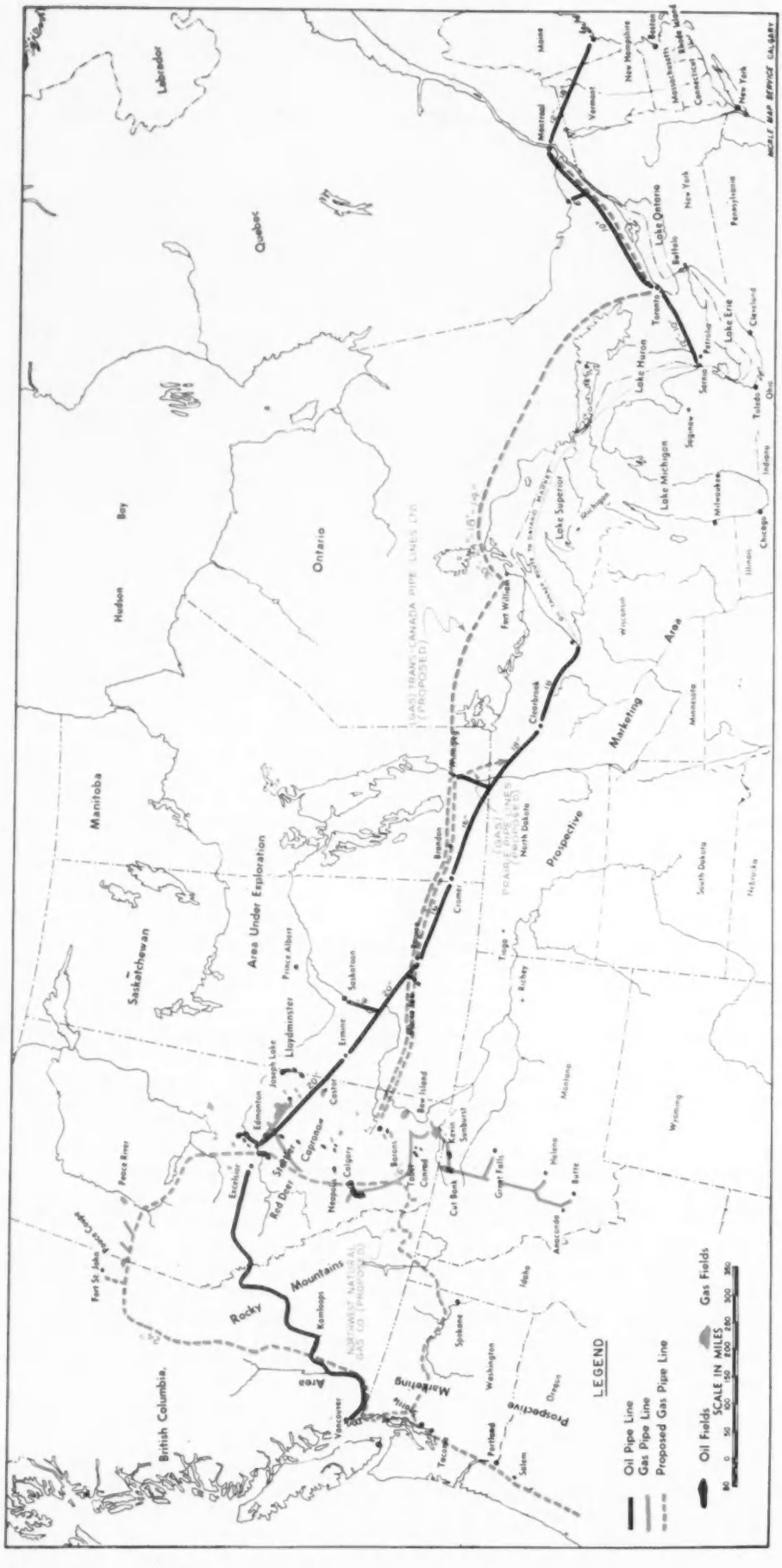
Northwestern Utilities operates 1132 miles of pipe line, including a 142-mile field gathering system comprising lines 16 inches or less at Viking-Kinsella. The company sold 24 billion cubic feet of gas in 1951. Northwestern owns 88 gas wells at Viking-Kinsella and buys gas from four wells in the field operated by the Hudson's Bay Oil and Gas Co. Ltd.

The 1129-mile Interprovincial Pipe Line from Edmonton to the Great Lakes is Canada's longest oil line. Brought into operation in 1951, the line extends southeasterly from Edmonton through Regina, Saskatchewan; Cromer, Manitoba; Gretna, at the international boundary, to Superior, Wis.

From Superior, Alberta crude is moved by tanker on the Great Lakes to the eastern Canadian market. Canadian crude for eastern use in 1951 averaged 35,500 barrels daily, and in 1952, 60,000 barrels daily. Also in the last year 3700 barrels daily were supplied to a Superior refinery.

The Interprovincial line consists of 16-, 18- and 20-inch pipe. During 1952 construction crews completed 100 miles of 16-inch main line looping on the central division to bring the 16-inch central portion's capacity

Pipe Lines of Canada



in line with that of the 20-inch western section between Edmonton and Regina.

Capacity after looping is 155,000 barrels out of Edmonton, and 100,000 barrels daily into Superior. At Superior tankers can handle a lifting capacity of 26 million barrels a season. Looping in the central sector increased the line's capacity out of Regina to 120,000 barrels daily required for maximum operation of the line.

Other 1952 construction by Interprovincial included pumping stations at Deer River, Minn., a pumping unit at Redwater, where a 16-inch extension connects with the Edmonton terminal, and completion of five 217,000-barrel storage tanks, the largest in the U. S., at Superior. Facilities at Superior are being built up to include a dozen 150,000-barrel tanks and 24 217,000-barrel tanks.

The Portland-Montreal Pipe Line, at the eastern end of the Canadian pipe line system, is the largest line serving Canadian refineries on a year-round basis.

The line runs from South Portland, Maine, through Maine, New Hampshire and Quebec to Montreal East. It was built in 1941 to avoid the long tanker haul through the St. Lawrence seaway. An extension of Portland Pipe Line Corp. line in the U. S., the line is operated on the Canadian side of the international boundary by Montreal Pipe Line Co.

The Montreal refinery area, largest in Canada, has a refining capacity of 157,000 barrels daily. South Portland storage capacity is 1,700,000 barrels, Montreal's, 198,000 barrels. The 236-mile route between the two is traversed by two main lines, 18 and 12 inches. There are four pumping stations.

Montreal refineries are operated by British-American Oil Co., McColl-Frontenac Oil Co., Shell Oil Co. of Canada and Imperial Oil. They receive crude via the Portland-Montreal line from Venezuela and the Middle East.

In Alberta, the largest field gathering system is operated by Imperial Pipe Line Co., a subsidiary of Imperial Oil Limited. With 255 miles of line in five major fields, Imperial handles an annual throughput of 40 million barrels of crude.

Formed in 1947, Imperial operates a system serving 880 wells at Leduc, 759 at Redwater and 35 at Excelsior. Two construction and maintenance crews are employed on a year-round basis.

From the center of the Leduc field, an eight-inch line via a terminal at

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Nisku reaches the Edmonton refinery area and the Interprovincial Pipe Line Company's western terminal. An eight-inch line running in an easterly direction connects the productive Golden Spike field with Edmonton, and six-inch lines tie the Acheson field, west of Edmonton, to both the Leduc and Golden Spike lines.

Imperial's 8- to 12-inch gathering system at Redwater and a six-inch main line from Excelsior, northeast of Edmonton, connect directly with Interprovincial pipe line. Interprovincial operates a 16-inch line between Redwater and Edmonton.

Winnipeg Pipe Line Company's 77-mile transmission line through the Red River Valley from Gretna, Man., to Winnipeg was completed in 1951. For the first time, Alberta crude was made available to Manitoba refineries.

In 1951 Winnipeg pipe line moved 3,795,000 barrels taken from the main Interprovincial line. An estimated 5 million barrels were shipped in 1952 from Gretna to Imperial and North Star Oil Company refineries at Winnipeg. Initial capacity, 23,000 barrels daily, could be boosted to 40,000 barrels through addition of a second pumping unit at Gretna. Tankage at Gretna totals 168,000 barrels.

The Montana gas line was built in 1951 under a special export permit issued by the Alberta Government at the request of U. S. defense authorities. The permit provided that 50 MMCF of gas could be removed over a five-year period from the southern Alberta Pakowki field for delivery to Anaconda copper works in Montana.

Under the Alberta permit, Montana Power Co. purchases gas reserves at Pakowki from McColl-Frontenac and Union Oil Co. of California. The line consists of a 70-mile, 16-inch main transmission line with 50 miles of 4- to 12-inch gathering pipe. Eighteen miles of the line are in Canada.

The route is from Pakowki across the international boundary and south from Cutbank to Anaconda and Butte, Mont., with branch lines to Great Falls and Helena. Estimated cost of construction was $3,250,000.

Valley Pipe Line Co. in southern Alberta operates two four-inch and one six-inch line over a 30-mile route to transmit petroleum and gasoline from Turner Valley into Calgary. The company operates a gathering system in the Turner Valley field, plus a tank farm and main pump station.

The three Calgary lines deliver an average of 7000 barrels daily to Imperial and British-American Oil Co. refineries. Valley Pipe Line Company is a subsidiary of Royalite Oil Co., principal operator in the Turner Valley field.

Texaco Exploration Company's Wizard Lake-Bonnie Glen pipe line by the end of 1952 will have completed its first full year of operation. The $900,000 line has played an important role in moving crude from the big new Wizard Lake field to the Edmonton refinery of McColl-Frontenac Oil Co. Ltd.

From Wizard Lake, where prolific oil production was discovered by Texaco last year, six-inch pipe is strung in a north-northeasterly direction over a 40½-mile route. Initial capacity of 7500 barrels daily was to have been increased to 30,000 barrels daily.

Edmonton Pipe Line Company operates a 39-mile six-inch line serving the Joseph Lake, Armena and Camrose fields southeast of Edmonton. Started in 1951, the line came into full operation this summer. Capacity is 15,000 barrels of crude daily. About 10,000 barrels were being delivered through the summer to Interprovincial pipe line terminal at Edmonton.

. . . . pipe lines completed in 1952

Major pipe lines completed in Canada during 1952 included:

- The Montreal-Hamilton products lines.
- Sarnia-Toronto products line.
- Saskatoon pipe line.
- Canadian Gulf pipe line in Alberta.

Trans-Northern Products Pipe Line from Montreal to Hamilton, Ont., bridged a major gap in eastern Canada's pipe line setup. Trans-Northern is a subsidiary of the British-American Oil Company, Shell Oil Company of Canada and McColl-Frontenac Oil Company.

The 442-mile 10-inch line, including a 6-inch branch line to Toronto, was completed in the fall of 1952. A 400-mile main line has a maximum capacity of 62,000 barrels of products daily. With four pumping stations in operation, the initial capacity was 40,000 barrels daily. Four more stations are planned to bring the line up to maximum throughput. Forty-two miles of six-inch pipe extend northwesterly from the main route to serve Ottawa.

Trans-Northern Pipe Line was planned to move products now being carried by railway tank cars and tankers on the Great Lakes. There is a possibility that in the future the line will be extended eastward from Montreal to eastern Quebec province.

That the line was required was discovered when lake traffic shut down during five months each winter, tying up products movement. Problems facing the oil companies from this situation included the fact that big stocks of products had to be built up at refineries and terminals during the seasonal shutdown. Tanker and storage facilities were inadequate.

Products demand in the thickly-populated area served by the line is estimated at 10 million barrels for 1952, 12 million barrels by 1954.

Pumping stations were built at Montreal, near Cornwall, Ont., and at Kingston and Trenton, Ont. Terminals are situated at Cornwall, Prescott, Brockville, Toronto, Hamilton, Clarkson, Ottawa, Port Hope, Kingston, and Belleville.

Initial throughput on the line was 30,000 barrels daily. Nineteen different products can be moved, including automotive and aviation gasolines, kerosine, fuel oils, and diesel fuel.

The Sarnia products pipe line, from Sarnia, Ont., to Toronto, was built to provide year-round transportation of Imperial Oil Ltd.'s Sarnia refinery products to the Ontario market area. Canada's first major products pipe line, it was completed in September.

Serving some of the most thickly populated areas of the country, the line is 188 miles in length, plus 14 miles of branch lines. It is owned and operated by Imperial Oil. The first 136 miles east from Sarnia consist of 12-inch pipe. A seven-mile spur line of double six-inch line runs from the main transmission system to Hamilton, Ontario.

One mile of the Hamilton branch runs under water, crossing Hamilton Bay. From Watertown to Toronto, the main line consists of 26 miles of single ten-inch line and 30 miles of double ten-inch pipe. Cost of the overall network was set at $11 million.

Operating with an initial capacity of 39,000 barrels daily, the line can be brought up to a potential capacity of 49,000 barrels daily. Principal products carried are gasoline, diesel and stove oil, and furnace fuels.

Construction of the line, which, like Trans-Northern, travels through thickly-populated areas, presented many problems. Special precautions

■ CONTINUED ON PAGE 258

CLAUDE A. WILLIAMS

"... they told the boy from Big Sandy to take their $193 million and go build himself a pipe line."

Pipe Line Portrait

Claude A. Williams

By AL REESE, WORLD OIL Staff

ONE WAY TO become boss of the world's longest pipe line is to attack East Texas racketeers with vigor and determination.

That's how Claude A. Williams started, and he wound up as president of Transcontinental Gas Pipe Line Corporation at the smashing climax of a success story that unfolded so simply and naturally that it's a wonder the piney woods aren't overrun with self-appointed policemen armed with buckshot and ambition.

As in a fictio. al success story plotted to contrast a lean beginning and a lush ending, Williams' first business venture was selling peanuts and peaches to passengers on trains that happened to stop in Big Sandy, Texas. The lad learned to hurry, for the trains didn't tarry long in Big Sandy. Neither did Williams. He moved on to Longview and to jobs as dish-washer, grass mower, garage helper, 5 and 10-cent store owner and credit manager; and then to California and later back to school for a degree in law.

In fiction, these early efforts of the hero would serve to build suspense. In real life, they taught Williams how to get along with people.

First important evidence of this occurred in Riverside, Calif., in June, 1930, when he married attractive Clara Boyle of Ogden, Utah. Not long afterwards he stepped off the train at Longview and began a career which was to lead to the formation of a company now worth $290 million.

Williams had many good friends in Longview, and so did his uncles, Rogers and Edwin Lacy. So when he was elected district attorney of Gregg County just six months after getting his lawyer's license, nobody was particularly surprised except Williams. Even now, he gets a boyish delight from the memory of that election day. It wasn't long, though, before some other people shared the surprise—if not the delight.

Booming East Texas in those depression days was a greenbacked oasis for sinful nomads. It was this element that suffered surprise, for the big, vigorous young district attorney went on a racket-busting crusade that endured after he left office and began the private practice of law. With his uncle Edwin he was largely responsible for the guarantee of honest elections through use of voting machines. He won a solid reputation, and it was natural for W. Lee O'Daniel, the new governor, to appoint him assistant secretary of state.

He did that job well and became chairman of the state unemployment compensation commission. From this point, Williams' career had less impetus from *who* he knew than from *what* he knew. He had learned to handle people; now he learned to handle affairs.

At that time there was a fight to federalize the state unemployment compensation commissions. Williams had made himself an expert on the subject, so he was the logical man to go to Washington and lobby on behalf of the states. In the capital, his imagination was set a-boiling by the report that the Big and Little Inch lines were to be sold. He moved fast, and with the help of Uncle Rogers Lacy there came into being the Transcontinental Gas Pipe Line Corporation, Claude A. Williams, president.

They bid on the Big and Little Inch —and lost. So now Williams was head of a transcontinental pipe line company that owned no transcontinental line and couldn't buy one. Here was a dilemma with a single simple exit: Build a line. He had the company and was convinced of the need, which left only one missing factor: The millions it would take to lay a line from Mercedes, Texas, to the insatiable New York market, 1840 miles away.

By this time the expert on unemployment compensation had become an authority on gas transmission lines. "I recognized the need," he says, "of

a gas line connecting the Southwest to the tremendous industrial areas of the Northeast and thought another line practical, feasible, and would be an economic success."

He took his knowledge and his big idea to the only financier he knew—a second vice president of the Chase National Bank, who helped him interest others. He talked, they listened, and the upshot was they told the boy from Big Sandy to take their $193 million and go build himself a pipe line.

The Williams custom of doing things in a forthright manner did not end when his new life settled to a workaday stride. No man for details, he surrounded himself with specialists in whom he has absolute faith and gave them a free hand.

Evidence that the big, smiling man is easy to work with is that his original group of key men has remained virtually intact.

Evidence, also, that Williams never forgets a friend is that three of his top lieutenants were associates from 'way back. They are Tom Wheat, secretary of the company and a former secretary to three Texas governors, the man who was in charge of planning Transcontinental's Houston office; Curtis Morris, vice president in charge of public relations and tax matters, who knew Williams in the Longview days, and B. D. Battle, the auditor, a former auditor for the state of Texas.

Another associate Williams has known for years is Thad Sanders, the personnel director, formerly with the Texas Unemployment Compensation Commission.

Any fictioneer could make Williams the prototype of the true-to-life hero who succeeds with determination and imagination, for nowhere in his makeup is there the stamp of the extraordinary. He is so utterly lacking in eccentricity that there is an almost absolute lack of anecdotes about him. He is so indifferent to personal publicity that there isn't a single clipping about him in the Transcontinental files.

He has a hobby—raising quail. He likes to fish from his 42-foot cabin cruiser, the "Clara Claude." He hunts, and recently bagged an elk. He attends the Baptist Church. Though not an inveterate joiner, he likes to be around people, and belongs to the River Oaks and Houston Country Clubs, Ramada Club, Houston Club and Petroleum Club.

Actually, the only thing that distinguishes him from almost anybody else is that he set out after a bunch of racketeers and wound up as boss of the longest pipe line in the world.

More Canadian Pipe Lines

■ CONTINUED FROM PAGE 256

had to be taken where high-tension power transmission lines were crossed. There were 31 river crossings, 16 provincial highway crossings and the line went through 800 individual properties.

In the west, completion of the Saskatoon pipe line provided economical transportation for crude moving from Alberta to Hi-Way Refineries Ltd. plant at Saskatoon, Sask. Owned by Saskatoon Pipe Line Company Ltd., the line consists of 56 miles of six-inch pipe. Completed late in the year, its capacity is 12,000 barrels daily.

Crude is tapped from the Interprovincial pipe line at a point near Minden, Sask., and goes to Saskatoon by an almost directly northerly route.

Canadian Gulf Pipe Line Company's 115-mile line from the Fenn-Big Valley-Stettler area to the Interprovincial Pipe Line Co. terminal at Edmonton was completed this fall. Estimated cost was $5 million.

Capacity of the line is approximately 35,000 barrels daily, with initial operating throughput of 10,000 to 11,000 barrels daily. Oil gathered from the Big Valley and Fenn fields is pumped through four- and six-inch lines to Stettler, where a mainline pump station moves the crude through a 12-inch line north to Edmonton.

Promising Route

The line passes through some of the most highly prospective oil areas of Alberta, and is built to handle anticipated increases in production. Fields served include Fenn, Big Valley, Stettler, New Norway, Duhamel, and Camrose.

Saskatchewan's first major natural gas distribution system, connecting the towns of Brock and Kindersley, was completed in October.

Gas from Brock field in southern Saskatchewan is moved through 16.5 miles of 4½-inch pipe to the towns, where it is brought into use by 14 miles of local distributing lines.

Owner and operator of the line is the Saskatchewan Power Corporation, a provincial government company. Capacity is 370,000 cubic feet per hour at peak load.

Ajax Edmonton Pipe Line Company proposes to build a line from gas fields in the Edmonton area to serve a $55 million petrochemical plant being built on the eastern outskirts of the city by the Celanese Corporation of America. Union Oil Company and McColl-Frontenac seek a permit to operate their Pakowki line into the U. S. on a long-term basis. At least four other gas export lines from Alberta are proposed.

Future of plans to export gas from Alberta will depend on the ability of the companies concerned to win an export permit from the Alberta and Canadian governments, and, if shipments into the U. S. are planned, from the U. S.

The Alberta government has said it will permit export only where the needs of the people first have been satisfied. The government also is known to favor an all-Canadian gas line rather than a line which would cross the international boundary to serve market areas in the U. S.

Only Westcoast Transmission Company, which plans to build a line from northwestern Alberta to the west coast, has received Alberta and Canadian permits to date. Westcoast now is seeking the approval of the U. S. Federal Power Commission. Other companies which have proposed gas export from Alberta include Trans-Canada Pipe Lines Ltd., the Canadian Delhi Corporation, Prairie Pipe Lines Ltd., Northwest Natural Gas Company and Western Pipe Lines Ltd.

Westcoast intends to build a 24-inch gas line from the vicinity of Pouce Coupe gas field in the Peace River area of northwest Alberta through Pine Pass, in the Canadian Rockies, to Prince George, B. C., and on to a point near Vancouver, where lines would be run to Vancouver and south to Washington and Oregon.

If and when required, Westcoast would build a line from Prince George, through the Yellowhead Pass in the Rockies to the vicinity of Edmonton to connect with Edmonton-area reserves.

The permit issued to Westcoast by the Alberta government is for a 22-year period. It provides that by Dec. 31, 1953, lines must have been built to serve a half-dozen communities in the Peace River area and that by Dec. 31, 1954, export of gas must have started. For the first five years of the contract, Westcoast may move 210 billion cubic feet annually.

Estimated length of the line, based on initial surveys which Westcoast has carried out along the route, will be 1900 miles. In the first stage, it would be built to Vancouver and the British Columbia lower mainland, to be extended at a later date to the market area in the U. S. Pacific Northwest. Estimated initial cost is $114 million.

Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

Herewith is the first of the new feature, "Rules of Thumb for a Pipeliners Notebook" announced last month.

When engineers and executives were told about the new feature, they liked the idea and acceded to the request of Don Taylor, Pipe Line Editor of WORLD OIL, that they contribute to it, so "Rules of Thumb" is a new baby with a wide parentage.

The feature was first described by letter and phone to a large group of engineers and executives last September, when their assistance was initially sought.

If you have devised or have in use a pet rule or formula, which is helpful in rapid calculation on pipeline matters, and which experience tells you has served you well, send it to WORLD OIL, Don Taylor, Pipe Line Editor, P. O. Box 2608, Houston, and let others share it. Many other pipliners are now sharing with you the contents of their personally accumulated notebooks in WORLD OIL's new "Rules of Thumb" feature. We want to repeat that these "Rules of Thumb" are offered primarily for just what the name indicates—fast formulae or rules by which rapid, but rough, calculations can be made. We wish also to repeat what was said last month—that some of these are so thoroughly based on mathematical calculations that they may be used in design, others, relating to materials, are so thoroughly based upon experience that they may be used in ordering supplies. However, it is our purpose to indicate such "Rules" as the foregoing and when they are not so indicated, they may be taken as rough, but reasonably accurate, approximations in their results.

It will be noted that each "Rule" is given a number which refers to its sequence of publication.

Pipe Line Construction —1

How much coal-tar enamel for a mile of pipe line?

For an average cover of 3/32 inch, multiply outside diameter of pipe by 0.6. The answer is in tons of enamel per mile. (Add 15 percent to take care of gate valves, drips, bends, etc.)

Examples:

How many tons of coal-tar enamel will be required to apply a 3/32-inch coat to a 26-inch pipe line?

26 x 0.6 = 15.6 tons per mile.

Add 15 percent to take care of gate valves, bends etc.

15.6 + 2.3 = 17.9 or 18 tons per mile.

How many tons of coal-tar enamel will be required to apply a 3/32-inch coat to a 8.625-inch pipe line?

8.625 x 0.6 = 5.2 tons per mile

5.2 x 15% = 0.8

Total . . 6 tons per mile.

These factors strongly affect the amount of coating used per mile on pipe lines: 1 Temperature of the pipe, and ambient temperatures. (It is assumed that the temperature of the enamel can be controlled.) 2. The kind of dope machine. 3. Humidity. 4. The number of bends per mile. 5. The number of valves, crossovers, etc. 6. Condition of the pipe.

This latter point has a great effect on the amount of enamel required for a mile of pipe line. In fact, where reconditioned pipe is being coated, it is recommended that the amount of enamel be increased by about 20 percent.

Engineering Design —1

How to find pipe weight from outside diameter and and wall thickness.

Weight (pounds per foot) = $(Dt - t^2 \times 10.68$, where D = outside diameter in inches, and t = wall thickness in inches.

Examples:

Outside diameter = 4.500", thickness = 0.250".

$W = (4.5 \times .25 - .25^2) \times 10.68$

$= (1.125 - .0625) \times 10.68$

$= 1.0625 \times 10.68 = 11.35$ pounds per foot.

The above formula is based on a density of 490 pounds per cubic foot for the steel. High-yield-point thin-wall pipe may run slightly heavier than indicated.

Corrosion Protection —1

What spacing for test leads to measure current on a pipe line?

Multiply the pipe weight, in pounds per foot, by 4; the result is a spacing which will give a resistance of 0.001 ohm, or one ampere per millivolt IR drop.

Example:

Pipe weight is 40.48 lbs. per foot; 40.5 x 4 = 162. Install test leads at 162 foot spacing.

The rule works for welded lines of grade B seamless; variations in steel may introduce errors as great as 15 percent. It is always better to calibrate a line section if accurate results are to be had, but if the above rule is used, the spacing will not be too small for satisfactory measurement, or too great for convenience in installation.

Construction scene on Northeastern Gas Transmission Company's line in Connecticut.

Northeastern Carries Gas to New England

THE initial construction program of 515-mile-long Northeastern Gas Transmission Company is complete, and three million persons in Connecticut and Massachusetts and New Hampshire are being served with natural gas for the first time.

This is a Tennessee Gas Transmission Company subsidiary company which receives gas from its parent company at the New York-Massachusetts border and distributes it to 35 gas utility systems throughout New England.

Completion of Northeastern Gas' system in New England finished a job started in the spring of 1951. The work was pushed and in September, 1952, the first natural gas service in New England's history was begun. By the end of the year Northeastern was delivering natural gas to the distributing systems of a dozen Massachusetts cities and towns.

Northeastern's 1952 construction included finishing the pipe line across Massachusetts to the seacoast at Gloucester, building a 100-mile spur line south across Connecticut and a 40-mile line north into New Hampshire near Concord. Service was given 22 additional gas utilities in the three states this year.

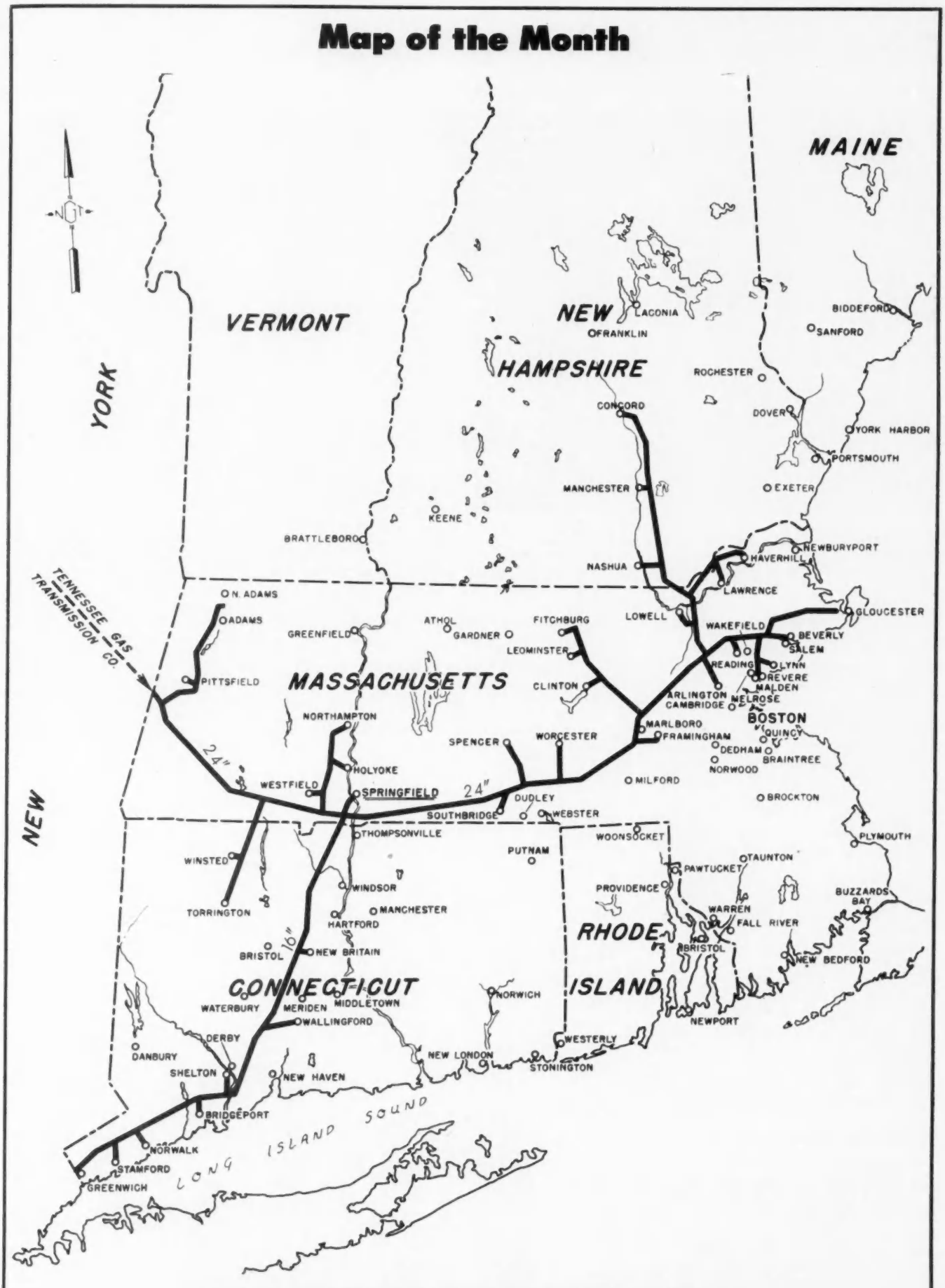
As a construction project, this new system is almost unmatched. The right-of-way runs through sandwiches of solid rock and bottomless peat bogs. It runs through forests, farms and populous suburbs, and crosses fertile—and sometimes historic—country estates.

At times it took almost as much time to restore the right-of-way to original condition as it did to lay the line. For example, on the stretch of 16-inch line which runs south from the east-west 24-inch line to Greenwich, Conn., the pipe passes underneath 1300 rock fences. While these fences are picturesque to sightseers, they were a nuisance to pipeliners. Each one meant removing a 50-foot-wide section of the fence, and then after the line was laid, replacing it stone by stone.

Meanwhile the system capacity of Tennessee Gas, operator of one of the nation's major natural gas transmission systems, has been increased to 1,350,000 MCF per day as finishing touches are put on a big 1952 construction program.

Arrival of the new fuel resulted in rate reduction by many utilities and a new public acceptance of gas as a fuel because of superiority of natural gas over manufactured gas. Some utilities are distributing 100 percent natural gas to their customers, while others are mixing it with manufactured gas.

Map of the Month



Northeastern Gas Transmission Company Pipe Line System

Pipe Line Men in the News

JUST ARRIVING for the general API session at the Conrad Hilton, Chicago, these happy pipeliners paused to talk it over. Left to right: C. L. Wilson and Dick Leonard, representatives of Anderson Bros. Corporation, Houston; Carl Anderson, president of Anderson Bros.; J. J. King, vice president of Tennessee Gas Transmission Company, Houston; and J. G. Jacquemines, assistant vice president of Anderson Bros.

M. Wendell Ramsey Appointed To Gulf Oil Pipe Line Office

M. Wendell Ramsey was recently appointed assistant general manager of pipe line operations for Gulf Oil Company activities in the U. S. and Canada. Ramsey, associated with Gulf Oil's general office executive department in Pittsburgh since 1950, has moved to Houston where Gulf maintains its pipe line office.

M. Wendell Ramsey

An Ohioan by birth, Ramsey was graduated from Wittenberg College in Springfield in 1938 and took his master's degree in business administration at Harvard Business School in 1940.

Before joining Gulf Oil, Ramsey served in the Supply and Transportation department of Standard Oil Company (Ohio) as manager of Crude Oil Supply and Distribution, and also in the Finance department as assistant to the vice president.

Schall Heads Houston Office

Fred Schall, chief geologist for Texas Gas Transmission Corporation, has been transferred from Shreveport to Houston to head up a staff being organized as complement for a newly opened Houston office. The Houston office is part of a program to discover and develop new sources of gas supply. The company will maintain its gas supply departments in Shreveport and Lake Charles, La.

Vaughan and May Incorporate To Form Construction Company

Engineering Construction Company, Tulsa, pipe line contractors, recently incorporated under the laws of Nevada and is a successor to the original partnership of Lee Vaughan and Russell D. May. Lee Vaughan is president of the corporation, Curt Vaughan, vice president; H. H. Griffin, vice president and secretary; Eugene Monnet, assistant secretary and assistant treasurer; and John E. Baker, assistant secretary and treasurer.

The company has two pipe line spreads and is, at present, working the Colorado Interstate line out of Keys, Okla.; the Cooperative Refinery Association line near Phillipsburg, Kansas; and has equipment and men at a third spread for the Midsouth Gas Company in Arkansas.

Two Pipe Line Companies Make Communications Staff Changes

Four pipe line communications engineers have received promotions or appointments with two pipe line companies. Panhandle Eastern Pipe Line Company recently appointed Hugh Edwards and Curtis Denison to the communications department. Service Pipe Line Company promoted Glenn J. Frisinger to chief of wire communications at Tulsa, succeeding E. A. Price, retired. Ray H. Warlick was promoted to assistant wire chief.

Edwards, formerly with Northwestern Bell Telephone company at Omaha, was assigned to the station at Paola, Kansas. Denison is assigned to the new communications building at Pittsfield, Kansas.

In addition, Panhandle Eastern transferred C. L. Rhodes, formerly radio engineer at Paola, to Dodson, Kansas to work in the newly constructed laboratory. A second new laboratory is under construction at Pittsfield.

Sharman Elected Executive Of Associated Contractors

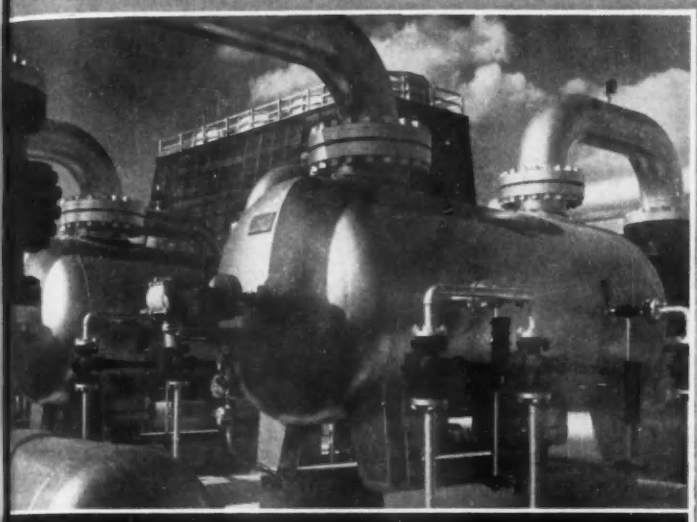
J. W. Sharman has been elected vice president of Associated Pipe Line Contractors, Inc., to fill the position left vacant by Earl Allen when he became president of the company.

J. W. Sharman

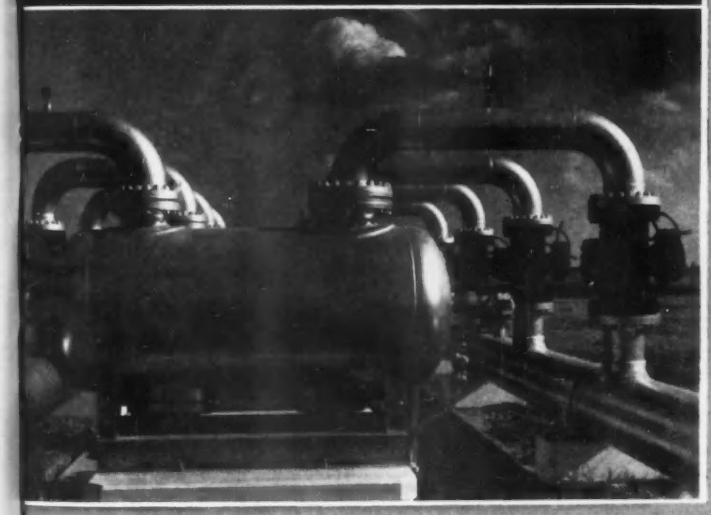
Sharman's election marks the renewal of his business association with Allen which began with the organization of Sharman and Allen to do pipe line construction for four years during the war. Sharman later became vice president of Latex Construction Company, from which position he retired when the company was dissolved two years ago.

L. C. Davidson, traffic manager for Cities Service Oil Company, and P. J. Bond, vice president of Pure Transportation Company, chat during a general committee luncheon at API meeting in Chicago.

King Gas Separator...Scrubber



ING SCRUBBERS INSTALLED ON A MAJOR PIPELINE EAR A COMPRESSOR STATION IN SOUTH TEXAS.



A revolutionary departure from conventional design, the King scrubber is both a liquid separator and an oil-bath cleaner, combined into a single vessel. It is designed to give *greater efficiency than any other oil-bath scrubber* in separating liquid from wet-quality gas, and dirt from dry-quality gas, without necessitating any change in scrubber set-up. Large capacity of each unit reduces the size and number of scrubbers required per million feet of gas to be handled. This reduces the capital investment required, not only in total cost of scrubbers but also in expense of foundations, fittings and piping.

GREATER GAS CAPACITY

LESS OIL LOSS

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LOWER INSTALLATION COST

King scrubbers are in use today by many gas pipeline companies, including several of the largest in the country. *Every one of these companies, after using King scrubbers, has placed an order for additional units.*

We shall be happy to give you complete information on the King separator-scrubber.

King

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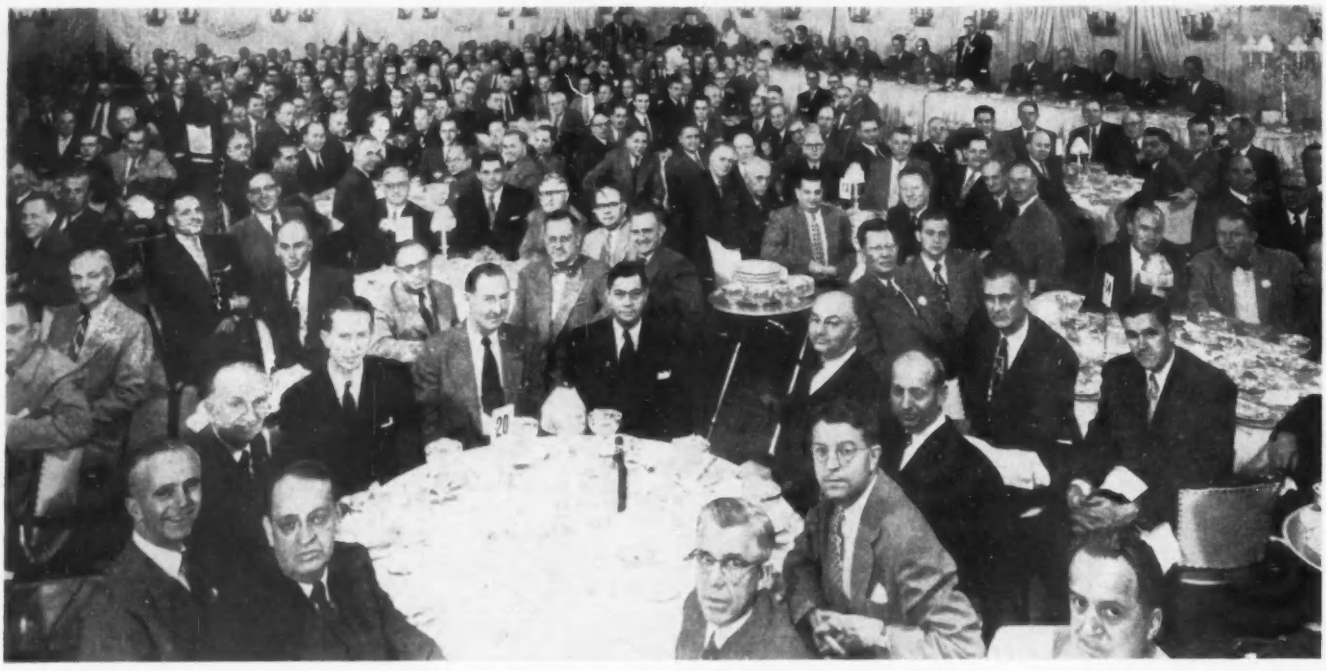
Pipeliners at the API



The Pipeliners' Club annual banquet was held in the Crystal Ballroom of the Blackstone Hotel. At the meeting, O. F. Moore, vice president and manager of the Pipe Line department of The Ohio Oil Company, was elected president for the 1953 term. He succeeds R. B. McLaughlin, chairman of the board of The Texas Pipe Line Company. J. L. Latimer, president of Magnolia Petroleum Company, was elected vice president.

O. F. Moore, vice president of Ohio Oil Company; C. F. Younts, president of Plantation Pipe Line Company, and John W. De Groot, president of Tuscarora Oil Company, Ltd., wait for the General Committee, Transportation, luncheon to begin in the Palmer House.

Hugh E. Dischinger, general superintendent, and S. S. Smith, manager, of Shell Oil Company's products pipe line department, confer in the lobby of the Palmer House. Smith presented a paper at the Transportation session on recent products pipe line developments.

Pausing to survey the scene are left to right: O. Q. Lomax, president of Humble Pipe Line Company; J. H. Peper, president of The Buckeye Pipe Line Company; K. A. Covell, president of Pure Transportation Company; and R. B. McLaughlin, board chairman of The Texas Pipe Line Company and retiring president of the Pipeliners' Club.

Paul H. Kuhns, Continental Oil Company, and J. W. Sinclair, Union Oil Company, both awarded API Certificates of Appreciation by the Division of Transportation in 1950, meet at luncheon.

Thirtieth Anniversary

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PIPE LINE *Construction*

By **ALICE L. GIVEN**, WORLD OIL Staff

The proposed Yellowstone Pipe Line route.

Conoco Plans Pipe Line Link From Billings to Spokane

Six hundred miles of eight-inch products line will be built by Continental Pipe Line Company from Billings, Mont., to Spokane. Named the Yellowstone Pipe Line, the carrier will originate at Billings, extend westward to Bozeman, Helena and Missoula, Mont., cross northern Idaho, and extend westward across Washington to Spokane. Terminals will be located on the line to provide service to western areas of Montana, parts of Idaho, and eastern Washington.

Ultimate capacity of the line will be 25,000 barrels of oil products daily. Construction of the line will get underway as soon as government approval is secured and pipe and materials assured.

Transco Starts Operation Of Second New York Gas Line

Operation of a second natural gas line into New York City was commenced recently when Transcontinental Gas Pipe Line Corporation successfully repaired damage to the newly laid line caused when a ship's anchor dragged the pipe from its unfilled bed in The Narrows of New York Harbor. Under the direction of Transcontinental engineers, Merritt-Chapman & Scott handled the repair job. At this time the trench has been back-filled with suitable soil and no further damage to the 6600 feet of under-water line is anticipated.

The new 24-inch line will supply five New York gas distributors. It enters Brooklyn from Linden, N. J., crossing Staten Island and The Narrows of New York Harbor. Transcontinental's original line into New York City crosses the Hudson at 134th Street.

Three Majors to Construct Evangeline Products System

Three major pipe line interests have started construction of a 196 mile, 16-inch refined products pipe line between Port Arthur, Texas, and Baton Rouge. This line, known as the Evangeline Products System, is being built by The Texas Company on behalf of all three participating companies. Texas and Gulf Refining Company have a 40 percent interest in the project and Sinclair Pipe Line Company has 20 percent interest.

Pumping stations located on the proposed route near the Texas and Gulf refineries at Port Arthur are already under construction, as is a pumping station on the route near the Cities Service refinery at Lake Charles, La. Line pipe is scheduled to be laid early in 1953 with completion of the line anticipated during the summer of 1954.

Sinclair will deliver to the carrier through a Houston to Port Arthur line which will be constructed simultaneously with the Evangeline System. Deliveries will be made to the Plantation Pipe Line Company at Baton Rouge.

DPA Approves Sinclair Plan On Houston-Port Arthur Carrier

Sinclair Pipe Line Company will build a $3,085,000 products pipe line from Houston to Port Arthur to make connection with the Evangeline Products System there. The line will be a 90 mile, 12-inch carrier originating at the Sinclair refinery.

Defense Production Administration has approved the project, and right-of-way and procurement work is now in process. It is hoped the project will be in operation during the third quarter of 1953. Sinclair was granted a 25 percent accelerated tax-write-off on the cost.

Four things line pipe men should remember: When you specify steel line pipe, always remember these four essential requirements:

1 Remember uniform quality. You are sure of this with Kaiser Steel line pipe, because it's produced by fully-integrated facilities, completely controlled at every step of production, rigidly tested before it's approved.

2 Remember dependable delivery. This is assured by Kaiser Steel in the western two-thirds of the United States. Every operation can be geared to meet your schedules *without* delay, because Kaiser Steel performs every step in pipe making, from raw materials mining to finished pipe fabrication.

3 Remember prompt service. Kaiser Steel men with long experience in working with the gas and oil industries stand ready to serve you whenever you say the word.

4 Remember wide range of sizes. Kaiser Steel pipe is produced in types and sizes to meet practically every requirement for petroleum, gas and water transmission.

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KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	8⅝" to 20" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅛" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	22" to 30" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser

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Dash line indicates construction areas.

Conoco's Mid-Continent Line Extension Under Construction

Work on a 127 mile, 12-inch crude oil pipe line between Oklahoma City and Wichita Falls, Texas, is underway for Continental Pipe Line Company. Construction contracts were awarded to R. H. Fulton & Company, Lubbock, Texas, and Western Construction Company, Hobbs, N. M. Estimated at $4,180,000, the project is scheduled for completion January 1.

Construction crews started laying the pipe from Oklahoma City and Wichita Falls. The route will skirt the cities of Norman, Purcell, Lindsay, Duncan, Comache and Waurika.

Further construction will include 18 miles of 12-inch pipe to be looped off the Oklahoma City to Ponca City line, roughly from Perry to Tonkawa. This loop will increase the daily capacity of that section of the line from 21,000 to 38,500 barrels.

Upon completion the Oklahoma portion of the carrier will be supervised by D. S. Skinner, Oklahoma district superintendent for Continental. Skinner will remain in Ponca City until the pipe line is ready for operation.

United Gas Operating New High Pressure Pipe System

United Gas Pipe Line Company recently began operation of a 975-mile "web" of new line to reinforce its existing system. The construction project included new compressor stations erected at Agua Dulce, Refugio, Edna, Needville and Goodrich, Texas; and at Lafayette and Montpelier, La.; and McComb, Miss. These additions, including expansion of the Magasco station, gave United Gas an additional 64,000 horsepower of compression.

This project got underway early in 1951 when the Federal Power Commission authorized the proposed construction. Starting point of the project was at Napoleonville, La., where a 30-inch pipe line was laid to the coast.

The first large-diameter gas carrier ever to be laid in the Gulf of Mexico, the line connects the Louisiana shore with new gas reserves near Eugene Island in the Gulf. From the coast, the line extends up through Southeastern Louisiana and thence northward to Kosciusko, Miss., where deliveries up to 390,250,000 cubic feet daily will be made to Texas Eastern Transmission Corporation. More than 470 miles of main and connecting line was laid in Louisiana and Mississippi.

Another section of the project is the 505 miles of pipe laid from Agua Dulce, Texas, to Perryville, La. At Perryville increased deliveries will be made to Mississippi River Fuel Corporation and Texas Gas Transmission Corporation.

Approximately 450 miles of the line is of 30-inch diameter, and the remainder is of 24- and 26-inch diameter.

Building West Texas Line

Panama Williams Company, Houston, has been awarded the construction contract for the Texas-New Mexico Pipe Line Company project in Crane County, Texas. Approximately 22 miles of 12¾-inch crude oil line is being built from Crane Station to the Rancho Pipe Line System's Mesa station at McCamey, Texas.

Beaumont to Newark Pipe Line Approved by DPA and Underway

Defense Production Administration approval of a 1600 mile products line from Beaumont, Texas, to Newark has assured early 1953 construction of the longest pipe line to be built in the U. S. United States Pipe Line Company, owner of the line, has set a $140 million cost estimate on the project.

Crutcher-Rolfs-Cummings, Houston engineering firm, is directing construction work for the project which will include a lateral line to the atomic energy plant at Paducah, Ky.

Feeder lines will connect with Houston, Texas City, Beaumont and Port Arthur, Texas, and Lake Charles, La., as gathering lines for finished petroleum products. The line will connect with Shreveport, also El Dorado, Pine Bluff and Helena, Ark., Memphis and Nashville, Tenn., Jackson, Miss., Lexington, Ky., Cincinnati, Dayton and Columbus, Ohio, and Pittsburgh and Harrisburg, Penn., before reaching its ultimate termination at Newark. The line from Beaumont to Jackson, will be of 26-inch diameter, changing to 24 inches between Jackson and Pittsburgh, and continuing from Pittsburgh to Newark as a 22-inch line.

Preliminary work on the line is already underway. United States Pipe Line has estimated the cost of the line, pumping stations, power lines, electrical equipment and rights of way at $137,171,000. Storage facilities will cost an estimated $2,610,000. Ten pumping stations will serve the line initially, with nine to be added at a later date.

Construction work should be completed by September, 1955. The pipe line will have an initial daily capacity of 300,000 barrels, 200,000 barrels of which will be delivered to Newark. The capacity will eventually be expanded to 500,000 barrels daily. A common carrier, the line will be operated without "shipper-owner" affiliations.

Texas Takes Up Obsolete Line

Associated Pipe Line Contractors, Inc., Houston, has been awarded contract by The Texas Pipe Line Company to take up a 10¾-inch pipe line from the pump station at Earth, La., and extending west to the Sabine River. Work on this 106 mile project is now underway. The new 22-inch line extending from Houma, La., to Port Arthur has replaced the smaller carrier.

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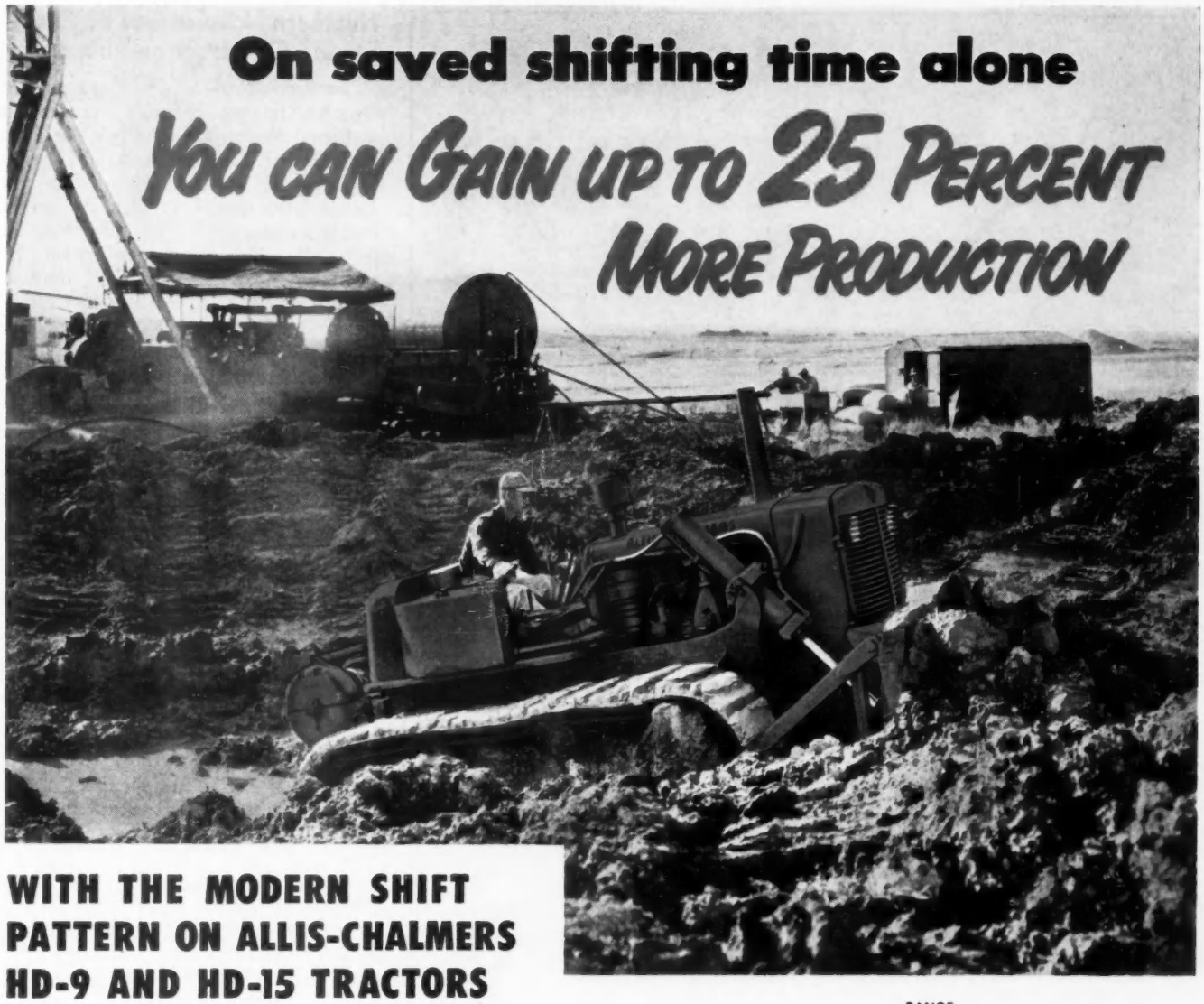

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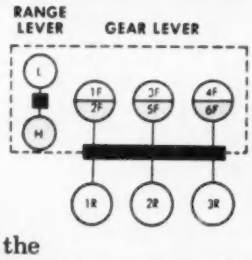

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Arrowheads indicate locations of gas powered turbine compressor stations being built along El Paso Natural Gas Company's Southern Mainline from Texas to California. The station at Cornudas is in operation now.

Gas Turbines Power Texas-California Line

El Paso Natural Gas Company is readying several new gas powered turbine compressor stations along its Southern Mainline system from West Texas to California. The original such station to be put in operation is located at Cornudas, 70 miles out in the desert east of El Paso. The Cornudas station began operation in September.

Plants at Pecos River in Texas, and Florida and Lordsburg in New Mexico, and at Benson and Casa Grande, Ariz., are expected to be in operation soon.

Each turbine-centrifugal compressor unit has a rating of 5000 horsepower and 5000 rpm. The company is already planning on adding a second unit to the stations at Lordsburg and Benson, and will eventually add two more units at Casa Grande, Florida, Cornudas and Pecos Rivers for a total of three each.

The gas turbines have proved to be very successful.

Four other units are already under construction at Hueco, Texas, Afton, N. M., and San Simon and Vail, Ariz. Under the present expansion program, two of the new turbine compressor stations will be constructed between every two existing reciprocating stations. The reciprocating stations were built 100 miles apart. The new turbine stations will serve to maintain an average pressure of 775 pounds as contrasted to the previous pressure of 690.

Sun's Texas-to-Toledo Link Nears Finish

With the completion of the West Texas Gulf Pipe Line and Mesa Pipe Line projects, expected sometime next month, Sun Pipe Line Company will have completed a pipe line link which runs from Midland, Texas, to Toledo. This six state hook-up includes four pipe line systems and enables West Texas crude to be carried back to the Sun Oil Company refinery at Toledo.

The origin of the link at Midland is a 24-inch pipe line which is jointly owned by five companies, Sun, Gulf Refining, Standard Oil Company (Ohio), Pure Oil Company and Cities Service Company. The Mesa system runs from Midland to Colorado City, Texas, where it becomes the West Texas Gulf Pipe Line and translates to 26-inch diameter. This line is sponsored by the same five companies and was begun last January.

The West Texas Gulf system continues from Colorado City to Wortham, Texas, with a 20-inch branch running over to Longview, Texas, while the main line moves southeastward to the Beaumont, Texas, area.

Sun's system connects with the West Texas Gulf line at Longview. Here the system is known as the Mid-Valley Pipe Line and travels to Lima, Ohio. The Mid-Valley line was built in 1946 by Sun and Standard (Ohio). At Lima the carrier becomes the Buckeye System pipe line and travels to Toledo.

The Mid-Valley system has been given increased capacity, from 155,000 barrels daily to 235,000 barrels, to take care of the West Texas Gulf crude traveling north to Toledo. Six booster stations were added.

Northern Natural Gas Begins Second Construction Phase

Northern Natural Gas Company of Omaha, having recently received a modified authorization from the Federal Power Commission, will begin construction immediately on facilities aimed at increasing its daily transmission capacity by 20 million cubic feet daily. This increase will likely be available next month. The increase will be over and above the 40 million cubic feet made available by construction completed in October. Under the same program an additional 90 million cubic feet will be made available early next summer. Total transmission capacity will be 825 million cubic feet when the entire $70 million program is completed.

Construction approved by the Federal Power Commission last June included a total of 213 miles of 26-inch loop pipe line additions, and an additional 100,160 horsepower in compressor capacity. The estimated cost of these facilities was stated as $38,690,000 in the FPC text.

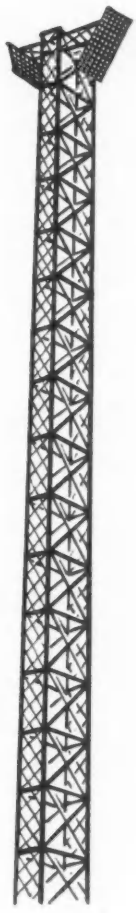
Northern Natural Gas Producing Company has been organized by the parent pipe line company to control Northern's wells and leases in the Hugoton Field of Kansas and the Panhandle Field in Texas. It will also operate wildcat acreage in Nebraska, Texas, Kansas, North Dakota, South Dakota and Canada. John Merriam, president of the parent company, is also president of the producing company. Merriam, Mark Adams and W. I. Robinson, Larry Shomaker, John Hanley and A. B. Dilworth are directors of the new company. Harry H. Siert is treasurer and B. H. Harper, secretary.

Merriam said the organizing of the new company should eliminate much of the confusion concerning Northern's production.

"The FPC has jurisdiction over our pipe line system, but does not have over our production," said Merriam. "This has caused confusion in our applications to the Commission for construction of new facilities."

Under this new organization Northern's subsidiary will be treated like any other producer. Northern has notified the Commission of the formation of the producing company, and that the gas reserves remain committed to this new construction through gas purchase contracts. Northern's construction authorization contained a paragraph in which the Commission outlined conditions under which the company could or could not alienate, transfer or sell its reserves.

During hearings conducted by FPC



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last June, Commissioner Nelson Lee Smith hit at the crux of the situation when he stated that pipe line companies should be encouraged to search for and to lease gas acreage and to produce gas, whereas in fact the traditional rate-making policies of FPC in respect to pipe line-produced gas has the effect of discouraging such pipe line activity. At that hearing Smith stated the economic necessity for pipe line companies to divorce their production properties from their regulated interstate pipe line operations.

FPC Denies Texas-Ohio Line For Insufficient Gas Supply

The Federal Power Commission ruled that Texas-Ohio Gas Company has failed to show proposed construction of a 1406-mile pipe line extending from Texas to Ohio for importation and transmission of natural gas from Mexico "is or will be required by the present or future public convenience and necessity."

The ruling denying authorization of construction stated that Texas-Ohio had failed to show sufficient pledged reserves or a sufficient market.

Canada Extension to Supply Northwest U. S.

Transmission for an excess of 200,000 barrels of Alberta crude daily is in the offing for the North Pacific Coast region of Washington. Trans Mountain Oil Pipe Line Company has authorized Canadian Bechtel Limited to begin planning, designing and engineering work on 30 miles of oil pipe line as an extension into Washington from the Edmonton-Vancouver line now under construction.

This 24-inch southward extension will connect with the main Canadian line at Sumas, B. C., and extend towards Seattle. Four miles of this section will be laid in Canada with 14 additional miles in Washington. A 16-inch lateral pipe line will originate from this extension at Laurel, Wash., and extend directly to the Puget Sound location of the proposed General Petroleum refinery at Ferndale, just north of Bellingham, Wash.

Initially this section of line from Sumas, B. C., to Seattle will have a transmission capacity of 120,000 barrels crude daily. However, future plans call for additional pump stations which will raise the capacity in excess of 200,000 barrels daily. It is estimated the line will cost $2,750,000. Construction will be started early in 1953, with the schedule calling for completion next year in time to serve the General Petroleum refinery at Ferndale which is scheduled to be completed in 1954.

General Petroleum's refinery at Ferndale will have a refining capacity of 35,000 barrels of crude daily upon completion. Estimated to cost $35 million it will manufacture 16,300 barrels of gasoline, 10,000 barrels of diesel and stove oils, and 6200 barrels of fuel oil daily. Bechtel Corporation, San Francisco, is agent for the construction.

Standard Oil of California and a number of other companies are investigating the possibilities for refining in Washington.

Sometime ago Trans Mountain officials indicated they would consider extending the pipe line farther south and increase the capacity of the carrier to serve the growing Northwest.

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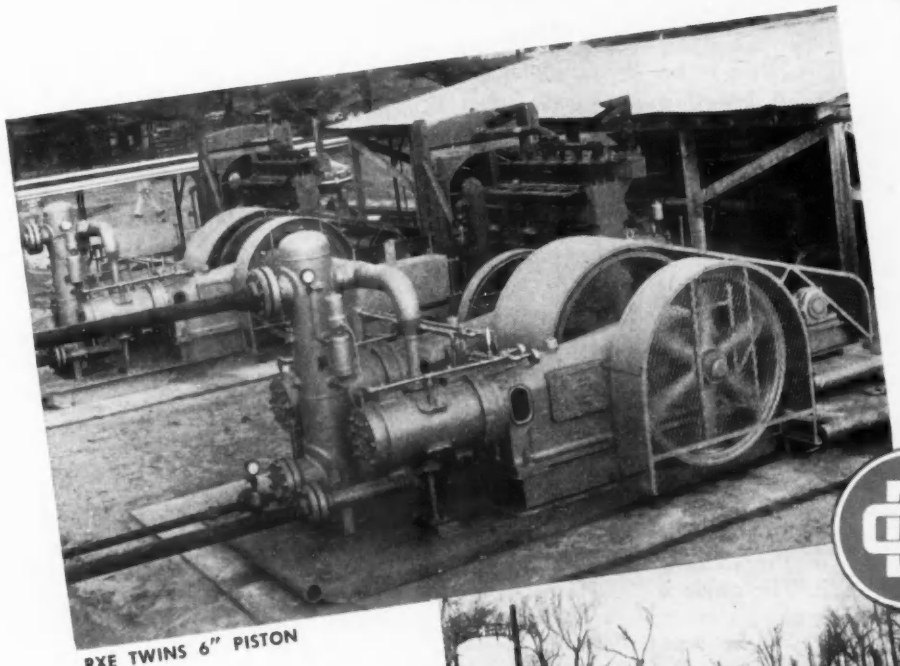

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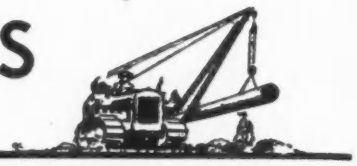
PIPE LINE HINTS



$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas

Spring Support Allows For Pipe Expansion

A considerable amount of trouble and costly repair work is often occasioned by the expansion and contraction of exposed piping due to temperature changes. If the piping handles high pressures, there is also considerable danger involved.

The photo illustrates a spring-loaded support for a 16-inch high pressure gas steam heater bend. The springs are heavy enough to give the needed support to the piping while remaining sufficiently flexible to follow any thermal expansion or contraction.

The hangers and pipe support are made of ¼-inch flat iron. The rods are ¾-inch and are threaded for a considerable length so that adjustments can be made properly. The springs are retained on the rods by large washers and nuts. The pipe itself rests on a formed template welded to the crossbar.

An installation such as this is economical, easily fabricated, and is preventation against bent and broken supports due to thermal forces.

Attachments Aid Slotting of Pipe

When it is necessary to drill water wells to provide adequate water for pipe line stations, a short cut may be taken. A few moments spent rigging up an attachment saves hours in making slots and makes the slots of uniform length and distance apart, both laterally and longitudinally.

The torch is held the proper distance from the pipe by means of a two-wheeled cart with an adjustable clamp to hold the tip of the welding torch. The guide is made from brass rods welded together with a space between by which the guide is fastened to the torch with a quarter inch bolt.

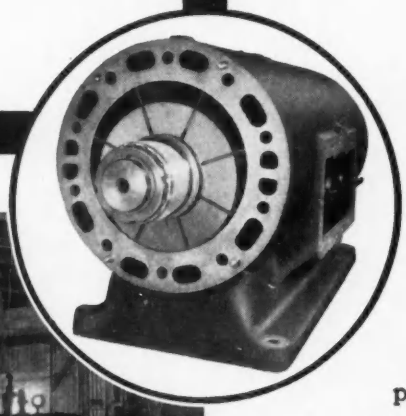
Using a No. 4 cutting tip, which makes a slot the width of a silver dollar, the 12-inch pipe is cut with slots eight-inches long, each four inches apart. The guide is set so that the operator sets the front end, which is looped at the begining of the slots, and the rear end protrudes sufficiently so that when it reaches the beginning of the slot which is being cut, the cutting stops and the next slot is started.

By using this method, relatively inexpierienced welders may be used with assurance that slots will be in proper place.

Moveable Road Block Made of Scrap Steel

A demountable road block made from scrap pipe steel and a 2- by 10-inch board will fit compactly into the pipe line crew truck. Stanchions for the block are made from 3½-foot lengths of four-inch pipe. The base of the stanchion is made of six-inch channel iron welded to the pipe. The upper part of the four-inch pipe is slotted to receive the 2- by 10-inch board. This unit is easy to transport, and in an emergency any sort of board may be substituted as crosspiece because no special slots or guides are required.

gas gets a better boost



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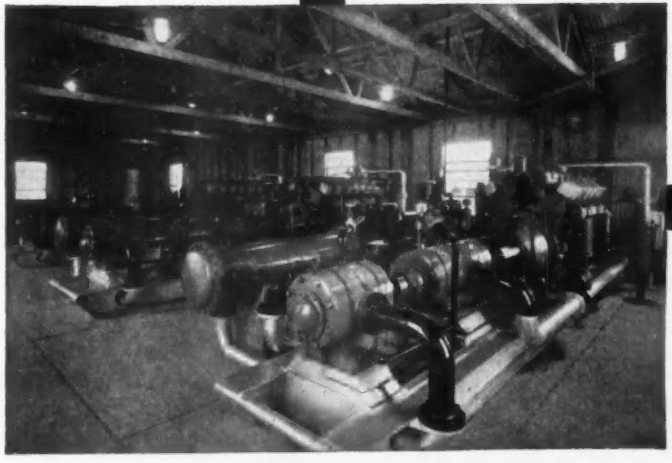

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If you're interested in getting maximum efficiency and economy into your operational picture, call on a Fuller Engineer. Bulletin C-5 contains a detailed description of Fuller Rotary Compressors. Write for your copy today. •

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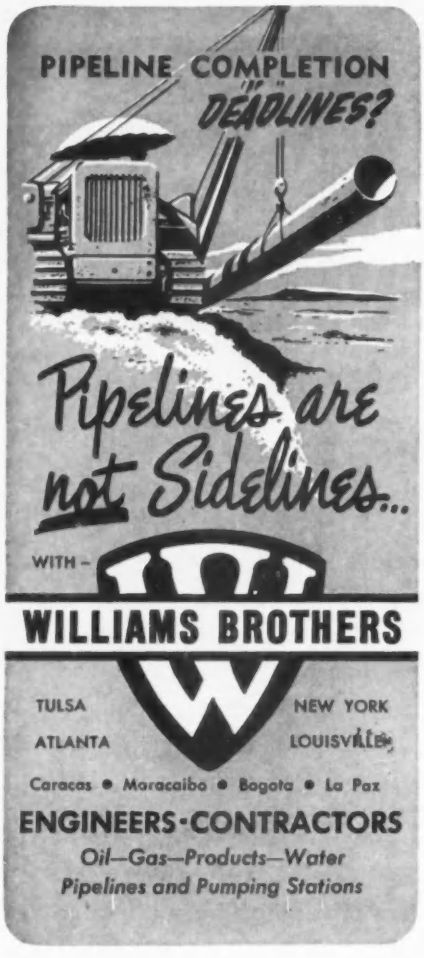
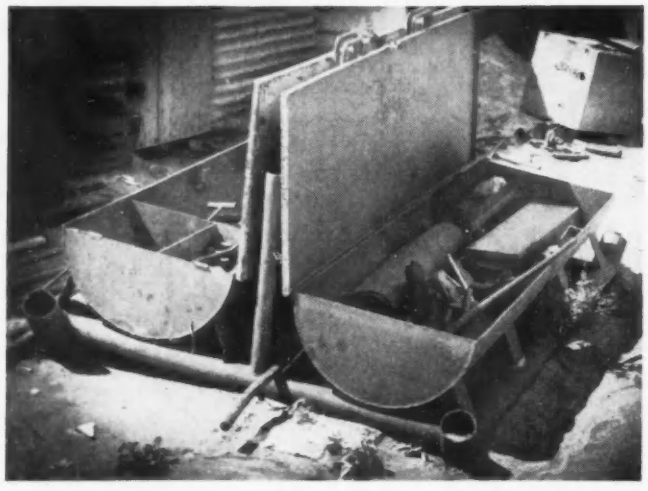
C-210



Tool Box on Skids Made From Pipe



A skid mounted tool box made from scrap pipe provides storage space for heavy tools on a construction job. The six-foot-long, dual compartment box can easily hold all the tools necessary for a gang of pipe fitters or riggers working on a plant construction job. At the same time it provides adequate protection against pilferage because of the heaviness of construction.

The tool box is made from scrap 24-inch pipe, cut in half and blinded at each end with ¼-inch steel plate. Each of the two compartments are attached to the skid, made of four-inch pipe with straps of ½-inch thick steel. A center post of two-inch pipe provides a stop for the lids of the twin tool boxes.

The lids are made of 5/32-inch steel plate. Handles for the lid were fabricated from ⅝-inch reinforcing steel. Each of the two sections are divided into compartments to fit the tools which will be stored in them. Hasps are provided for locking the compartments.

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A rubber-tired welding machine rig provides the utmost in convenience for welders. On it, there are a water can, an umbrella stand, a rack for welding cable and a storage box for welding rod, lunches and supplies. It can be quickly coupled to a small farm-type tractor for rapid movement down the line.

The frame of the rig is made of strap-iron and steel bar. The axles are standard and the machine is supported by car springs.

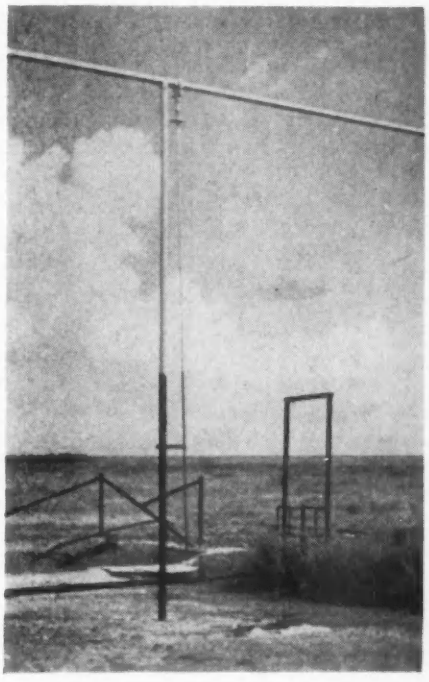
The water can is mounted on the frame, held in place by steel straps. The cable rack is made of two-inch pipe with a short hook of ¾-inch rod. The umbrella stand is simply a short rod sized to fit inside the handle.

The storage box at the end of the rig is made of light gauge plate. It contains compartments for welding rod, electrode holders and lunches. It has room enough for personal possessions of welders.

In making the jumps down the pipe line, welders and helpers are able to ride on the rig in safety.

Extension Handle Operates High Valve

Easy and safe operation of an overhead gate valve by an extension handle is shown in the photo. The valve is installed next to a support on a



vent line from the lease tanks. A short ½-inch nipple is welded to the wheel handle of the valve. A length of ½-inch pipe with a collar tack welded on is then attached to the nipple, and a pin run through both collar and nipple to prevent unscrewing the handle. A ¼-inch strap iron bracket is made to align with the handle to keep it from being bent or broken off. This bracket is bolted to the vent line support.

This extension enables the pumper to operate the valve from the ground without the inconvenience and danger of using a ladder. This method also saves considerable time required for ladder toting.

Tire Mounted Tank Supplies Engine Oil

A triangular shaped tank mounted on rubber tires provides a handy way to add oil to individual compressor

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engines. In contrast, many compressor buildings are equipped with stationary lube oil pumps from which operators fill containers and carry oil to engines. The tank cart shown in the illustration can be filled from a central point in the compressor building, then rolled to the various engines, and oil added directly at the spot. The oil pump atop the cart measures the oil as it is added.

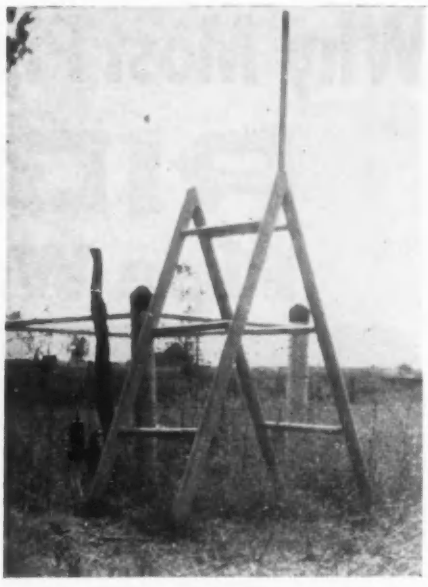
The cart can be easily made at any compressor station shop. It was fabricated of light gauge steel plate. A sump in the bottom provides a means of draining it from time to time. The hand lube oil pump extends no closer than six-inches from the bottom of the sump.

Two of the wheels on the cart are fixed. A third wheel at front of the cart is free to turn. The cart can be guided from the handle at back of the cart.

Fence Stile Is Goodwill Gesture

Fences crossing a buried pipe line usually present an annoying impediment for the man whose duty is to patrol the pipe line on foot.

A simple stile made of scrap pipe, and welded together as shown, can be placed a-straddle the fence close



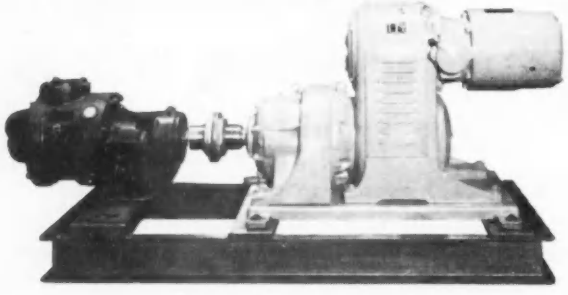
to the pipe line to give the line walker simple access to the opposite field. The stile furnishes the pipe line workmen with "ingress and egress from the premises . . . for the purpose of inspecting . . . said pipe line, and/or pipe lines," without damage to the fence, thereby fostering goodwill between the pipe line outfit and the fence owner.

In addition, the pipe line walker can mount the fence without tearing his clothing.

Fire Extinguishers Hung in Bracket

Since the danger of fire is always present wherever petroleum is being produced, stored or transported, it is necessary that adequate provision be made for fighting any possible fires. The photo shows a simple, easily made bracket for a soda-acid type extinguisher which is the type usually placed on the leases. The support is made from two-inch junk pipe which is driven into the ground to a depth of three feet for steadiness. The brackets are made of ¼- by 1-inch strap iron, bent as shown, and welded to the pipe. The extinguisher is mounted in a convenient, easily-accessible place where it is always ready for use. This bracket is readily converted to support other types of extinguishers merely by changing the dimensions.

An Interesting VIKING Unit



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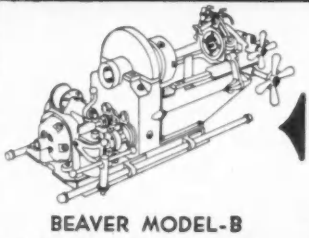

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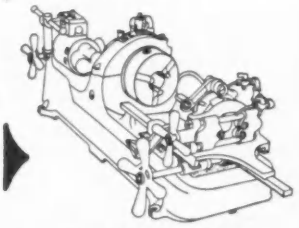

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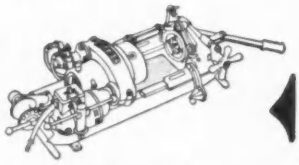

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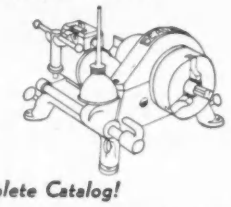

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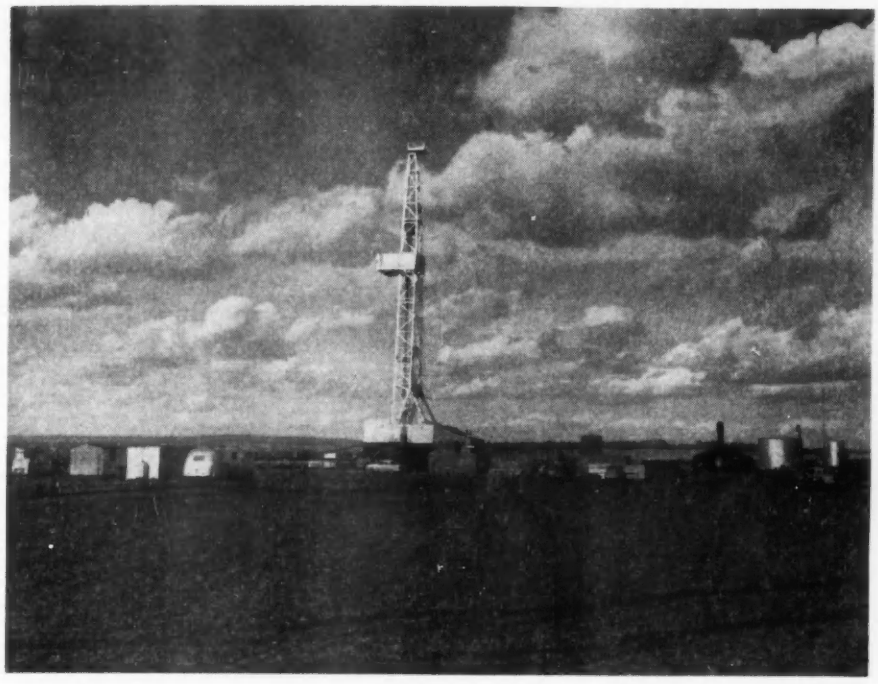

This drilling well is situated in recently discovered Clive field in Central Alberta, where production is found in both D2 and D3 Devonian.

Canada in 1952—

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By GILBERT M. WILSON
WORLD OIL Staff

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Before Leduc, for example, Western Canada production was only 19,000 barrels a day. Today, Western Canada's potential daily production is about 275,000 barrels. It is estimated that in 1953 this will have increased to around 300,000 and, by 1954, to 420,000 barrels daily. Where, before Leduc, there were only 19 drilling rigs operating, there are now about 260 capable of operating, 175 of which are in Alberta.

Although some rigs still are idled as a result of steel shortages brought on by the U. S. steel strike, the situation is improving and, should be alleviated by next year. Approximately half of the drilling rigs in Western Canada are working on wildcat wells. It is estimated that around 300 rigs will be operating next year in the Prairie provinces.

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Drilling activity in Peace River district of British Columbia and Alberta received impetus in 1952 when approval was granted to export gas to Pacific Northwest area. Here a drilling rig is operating in Fort St. John area of British Columbia.

engines. In contrast, many compressor buildings are equipped with stationary lube oil pumps from which operators fill containers and carry oil to engines. The tank cart shown in the illustration can be filled from a central point in the compressor building, then rolled to the various engines, and oil added directly at the spot. The oil pump atop the cart measures the oil as it is added.

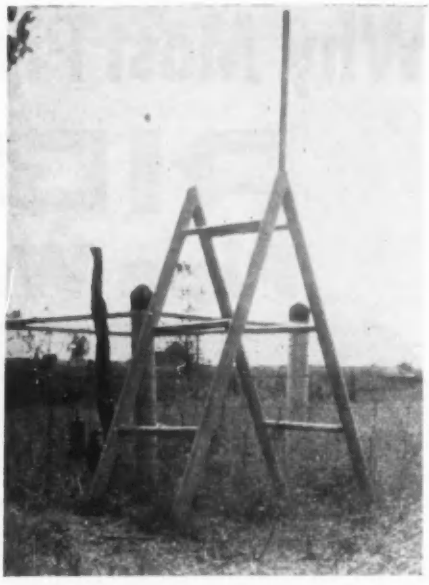
The cart can be easily made at any compressor station shop. It was fabricated of light gauge steel plate. A sump in the bottom provides a means of draining it from time to time. The hand lube oil pump extends no closer than six-inches from the bottom of the sump.

Two of the wheels on the cart are fixed. A third wheel at front of the cart is free to turn. The cart can be guided from the handle at back of the cart.

Fence Stile Is Goodwill Gesture

Fences crossing a buried pipe line usually present an annoying impediment for the man whose duty is to patrol the pipe line on foot.

A simple stile made of scrap pipe, and welded together as shown, can be placed a-straddle the fence close



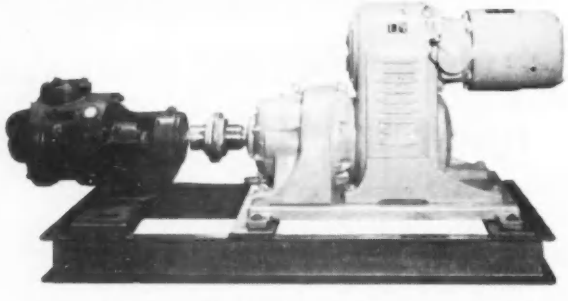
to the pipe line to give the line walker simple access to the opposite field. The stile furnishes the pipe line workmen with "ingress and egress from the premises . . . for the purpose of inspecting . . . said pipe line, and/or pipe lines," without damage to the fence, thereby fostering goodwill between the pipe line outfit and the fence owner.

In addition, the pipe line walker can mount the fence without tearing his clothing.

Fire Extinguishers Hung in Bracket

Since the danger of fire is always present wherever petroleum is being produced, stored or transported, it is necessary that adequate provision be made for fighting any possible fires. The photo shows a simple, easily made bracket for a soda-acid type extinguisher which is the type usually placed on the leases. The support is made from two-inch junk pipe which is driven into the ground to a depth of three feet for steadiness. The brackets are made of ¼- by 1-inch strap iron, bent as shown, and welded to the pipe. The extinguisher is mounted in a convenient, easily-accessible place where it is always ready for use. This bracket is readily converted to support other types of extinguishers merely by changing the dimensions.

An Interesting VIKING Unit



Viking Pumps are leaders in service to the Oil Industry . . . tops in performance and dependability.

Shown here is a versatile unit of the heavy-duty style designed to handle thin or viscous liquids. Capacity ranges from 10 GPM to 1050 GPM with pressure to 200 lbs. This unit shows totally enclosed vari-drive with a wide speed range.

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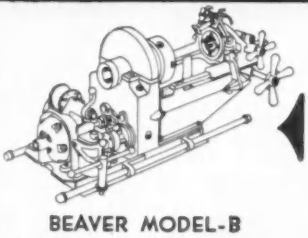

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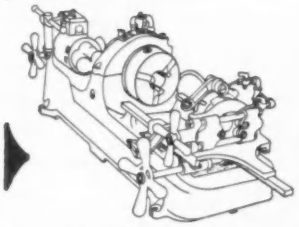

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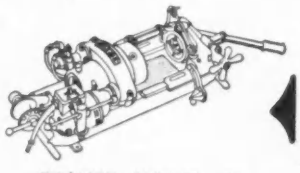

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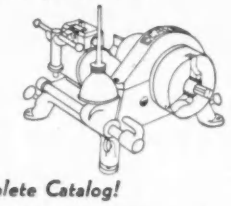

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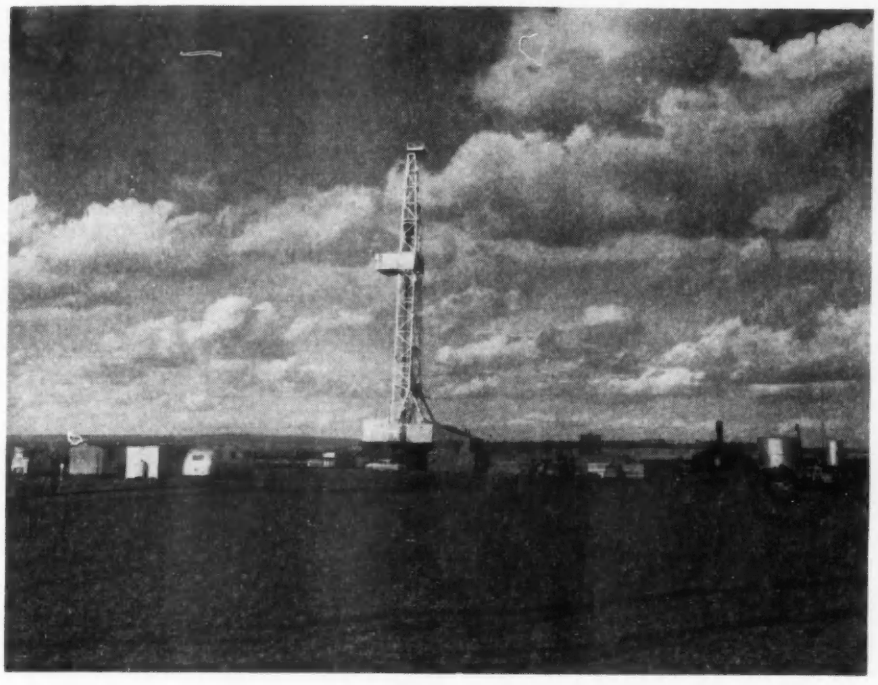

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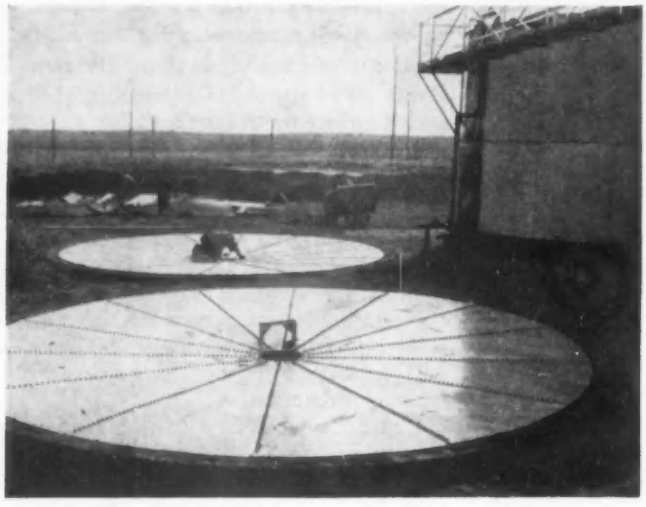


This tank battery is being erected in recently-discovered Bonnie Glen area of Central Alberta.

A newly-completed pumping well in Joseph Lake field, northernmost of Viking sand fields in the 20-mile long belt extending southeast of Edmonton.

cubic feet, and still are growing rapidly.

Exploration and development costs for 1952 are estimated to amount to $250 million, compared with only $12 millions before Leduc. Key indicators in the exploration effort, according to John R. White, executive vice president of Imperial Oil, show that exploration activity is up over last year by something like 50 percent, to almost double the figures of 1951. And, by the end of 1952, it is estimated that approximately one billion dollars will have been spent by the Canadian oil industry in exploration and development. About half this money, it is estimated, came from American sources.

During 1952, many reservations were taken out in the thinner sediments in the eastern edges of the sedimentary province; also in the deep Foothills region along the western slope of the Canadian Rockies. Exploration work is being done on reservations extending half way from the northern border of Alberta to the Arctic Circle.

The area of Western Canada considered favorable for the finding of oil and gas is believed to be about three times that of the State of Texas, with proven reserves as yet only about $\frac{1}{10}$th those of Texas. An estimated $200 million is being spent each year for land acquisition and development purposes. Some idea of the exploratory effort being made can be gained by the comparison of geophysical parties, which numbered about 11, before Leduc and the approximately 175 parties that now are in the field in Western Canada.

Total operating oil wells in Western Canada this fall numbered about 3450, with approximately 3200 of them credited to Alberta and 250 in Saskatchewan and Manitoba. On the basis of drilling activity so far this year, it is estimated that around 2000 wells (of all categories) may be drilled and, if casing and tubular supplies are adequate, next year's drilling program might amount to between 2500 and 3000 wells.

Discovery Rate Up. The four western provinces, according to statistics compiled by *The Daily Oil Bulletin*, Calgary, accounted for 133 indicated oil or gas strikes by mid-September, an average of nearly one strike every two days since the first of the year. Some of the discoveries have not as yet been completed and their final status will not be known until later, but it is significant to note that at the current rate, the Western Canada discovery rate tops that of 1951, which averaged one new oil or gas discovery every three days.

Of the 1952 discoveries so far indicated, 68 are oil, 44 of them being light oil, nine medium gravity and 15 heavy oil. A further breakdown of the figures reveals that Alberta recorded over three-quarters of the discoveries, with 100 new finds made in 92 wells. Of these new strikes, 36 were light oil, four were medium gravity and six heavy crude. Gas discoveries in the province numbered 54, with nine of these being wet gas finds.

In second place, Saskatchewan, in the same period, accounted for 22 discoveries, made in 20 wells. Of these, 16 were oil, two of them being light gravity, five medium gravity and nine heavy crude producers. Six more discoveries were listed as gas producers.

Third in the number of discoveries made up to this time in 1952 is British Columbia, which accounted for nine discoveries, most of them in the Fort St. John area, situated in the northeastern edge of the province. Of these new strikes, four were listed as light gravity finds of as yet undetermined size and the remainder were gas. Some of the discoveries were important extensions to already recorded zones. Manitoba had contributed two discoveries during this same period, both of them light oil.

Proved oil and gas reserves of the several provinces are impressive. In addition to the 1.75 billion barrels of crude oil and the 9000 billion cubic feet of gas estimated to have been accounted for so far in Alberta, Saskatchewan has an estimated 60 million barrels of crude and 100 billion cubic feet of gas; Manitoba an estimated 10 million barrels of crude; British Columbia an estimated 1300 billion feet of gas and as yet undetermined quantities of crude. The Northwest Territories has an estimated 30 million barrels of crude reserves.

Carl O. Nickle, member of Parliament for Calgary West and publisher of *Daily Oil Bulletin,* in a recent address before the annual western meeting of the Canadian Institute of Mining and Metallurgy at Winnipeg, accompanied these reserve figures with a prediction that each of the western provinces and the Northwest Territories "will come forth with ultimate reserves far vaster than those known today."

The result, he said, will be a spreading to all parts of the West of a greater measure of the direct and indirect benefits of oil wealth now going in lion shares to Albertans. Alberta, he said, has only a third, not a monopoly, of the 770,000 square miles

of Western Canada considered geologically favorable for oil and gas accumulation. Some idea as to what the future holds for Western Canada oil development activity, he said, can be gained by noting that reserves of the western provinces have been developed by an intensity of exploration less than five percent of that to date in the great U. S. oil producing states.

Wizard Lake Trend. Probably the most spectacular of the 1952 discoveries to date have been the Bonnie Glen, Pigeon Lake and Fiveland finds, each several miles apart, and extending in a southwest direction from the famed Wizard Lake find of last year.

Like Wizard Lake, the new finds produce high gravity oil from very thick Devonian D3 reef sections and development work is still continuing at a rapid pace. Bonnie Glen, with its 312 feet of oil column and 288-foot gas cap, thus far is expanding its productive area, with no definite limits as yet in sight.

Of even more significance is the recent discovery, in a wildcat about midway between Bonnie Glen and Pigeon Lake fields, that the two fields apparently are linked together. Development work still is progressing and it probably will be some months before any reasonable estimate can be made as to the extent of the new fields. Some authorities have hazarded an estimate, however, that the Wizard Lake trend, representing as it does about six fields in the Devonian pay, will provide an estimated 200 million or more barrels of crude reserves—a figure that compares with the probable yield of the Leduc field. Depth of wells in the Bonnie Glen area range from 6000 to 7000 feet.

Another trend that is shaping up as a major source of light crude is the so-called Viking Sand Trend, a southeast-trending chain of Viking sand producing areas extending for a distance of between 20 and 40 miles southeast of Edmonton. Consisting of three principal fields, Joseph Lake discovered in 1949 and Armena and Camrose, discovered in 1951, the area has been the scene of a number of new finds over the past year, a number of them as yet undefined.

Production from the Viking sand (Cretaceous age) is encountered at depths of from 3200 to 3300 feet. The belt represents the largest reserve in Canada of light gravity oil producing from a sand formation. Current estimates of recoverable crude run in excess of 32 million barrels. Activity still is brisk, the area having accounted for 145 completions in the first nine months of the year, as against some 267 completions in the large Leduc-Woodbend-Kavenaugh area southwest of Edmonton.

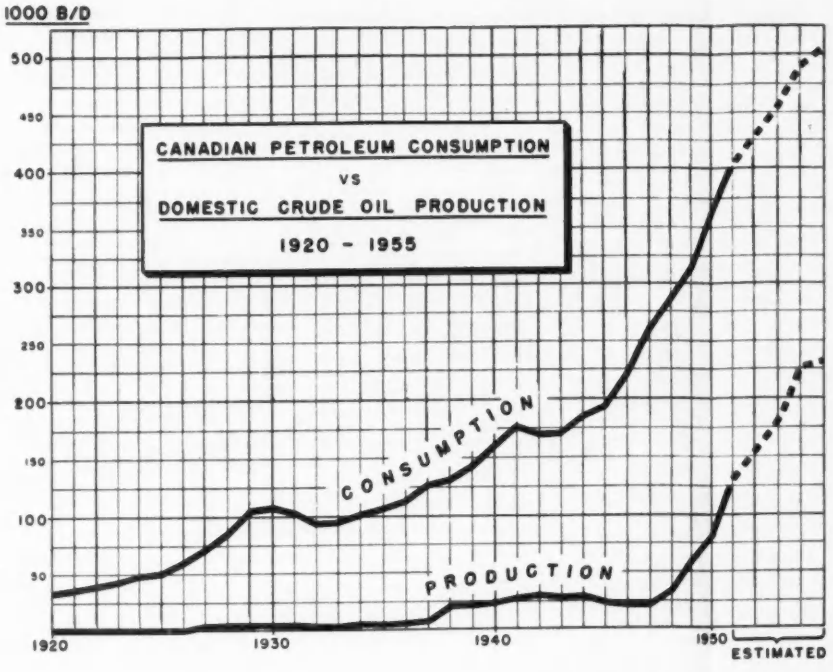


Chart Courtesy Imperial Oil Ltd.

FIGURE 1.
Curves show trend of Canadian petroleum demand and crude production since 1920, together with a projection of the curves through 1955.

The Nevis area, west of Stettler, another important 1952 find, with only six wells drilled or drilling, already is shaping up as a major wet gas reserve producing from the Devonian.

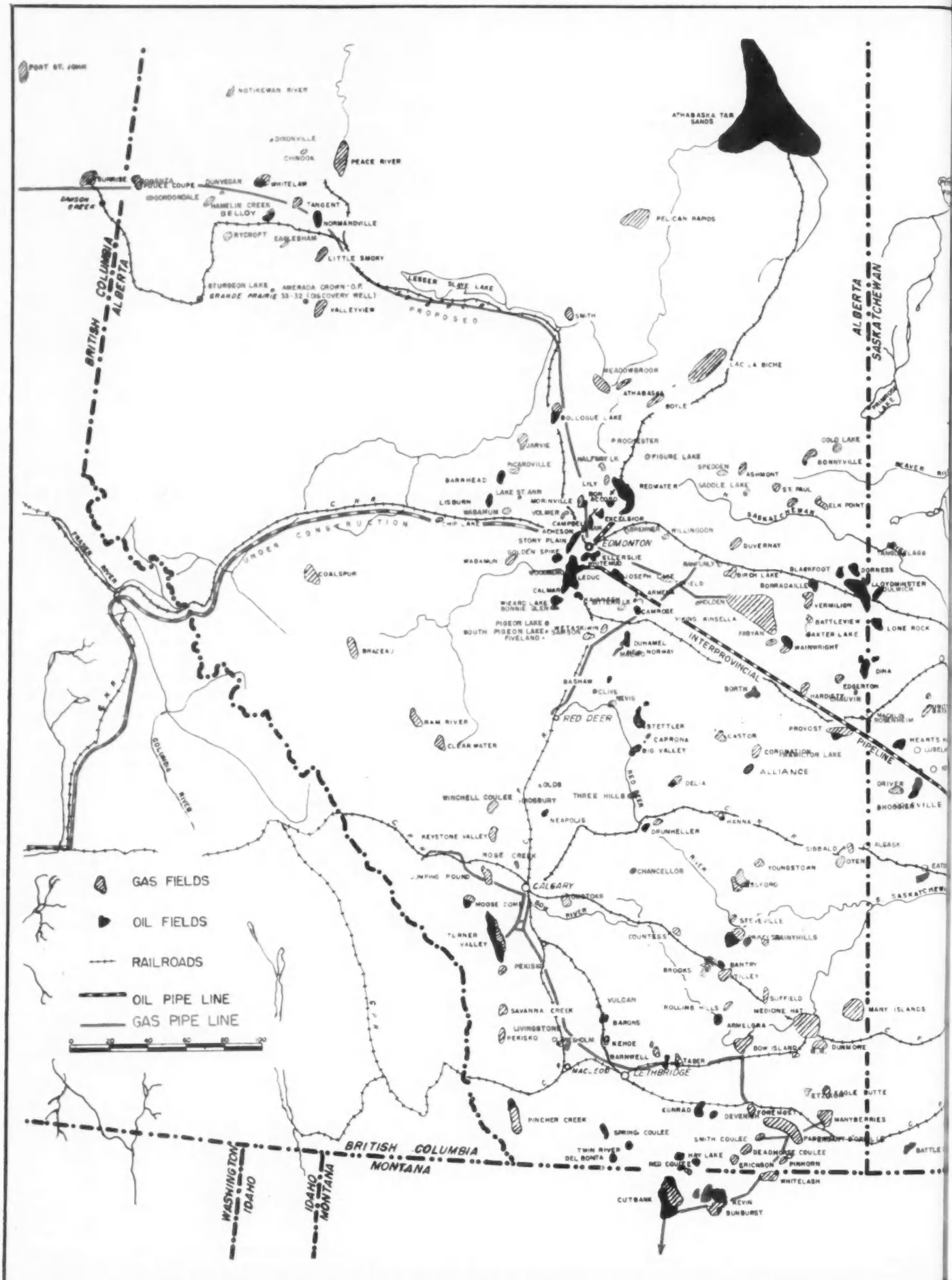
Of significance, also, this year, was the discovery by Amerada Petroleum of what apparently is Devonian D3 reef, or its equivalent, in its Sturgeon Lake wildcat in the Peace River region some 185 miles northwest of the Redwater field. The well, completed in 90 feet of water-free reef zone, flowed 35 gravity oil at an indicated 700-barrels per day rate from a depth of 8900 feet. Without doubt, this very important and significant discovery will stimulate additional wildcatting activity in the area.

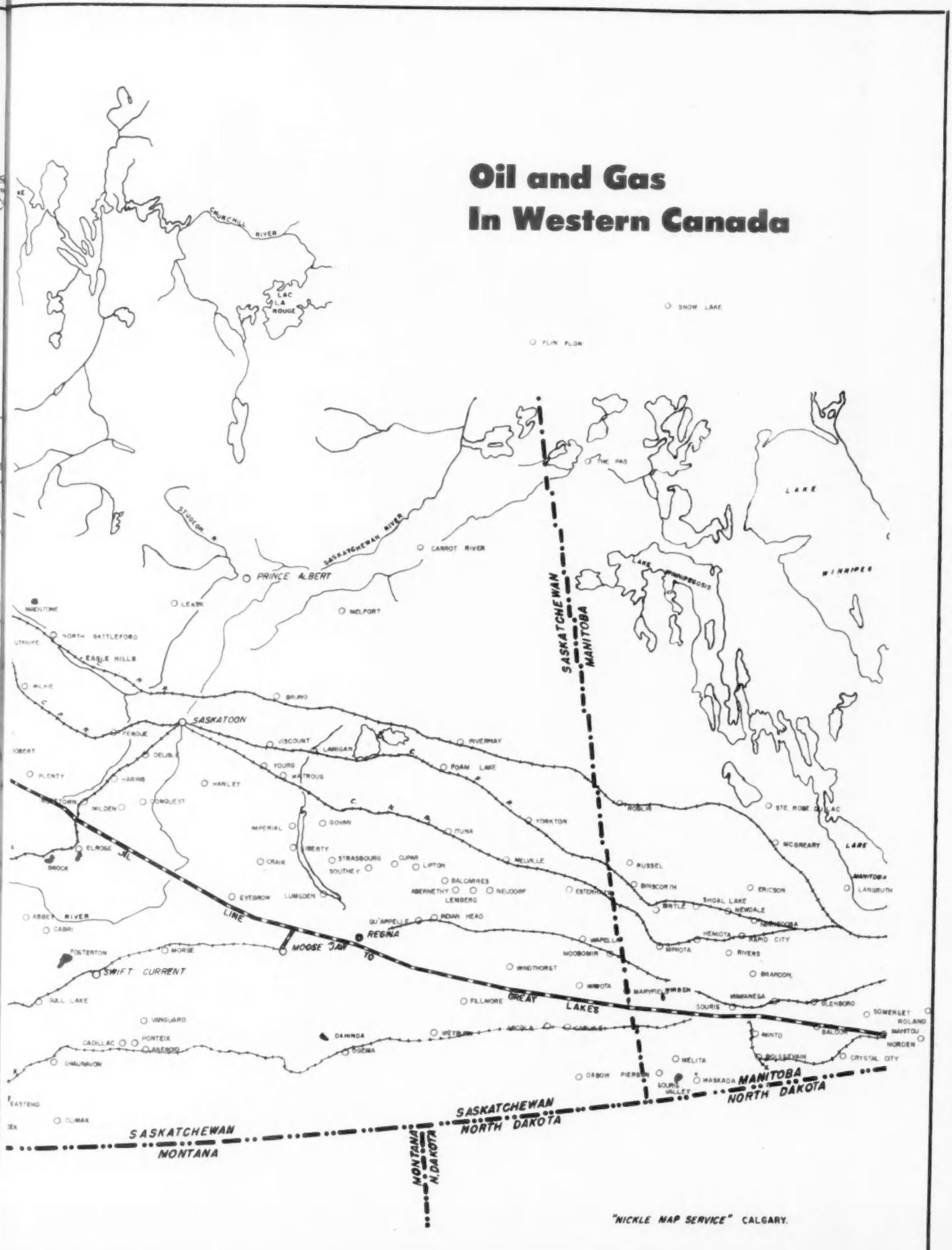
Gas Development. During the year, gas development received a definite impetus when approval was granted to export gas from the Peace River

TABLE I

DRILLING ACTIVITY	AUGUST, 1952 Month	AUGUST, 1952 Cumulative For Year	JULY, 1952 Month	AUGUST, 1951 Month	AUGUST, 1951 Cumulative For Year
Licenses Issued	140	1,111	141	124	832
New Producers, Oil	100	610	76	64	502
New Producers, Gas	.....	9	2	7	19
Wells Abandoned	56	350	47	42	215
Footage Drilled	515,935	4,264,336	574,375	537,374	3,502,538
Rigs Operating	136	1,274	142	134	.....
NUMBER OF CRUDE OIL WELLS:					
Leduc-Woodbend	969–1012	.....	951– 979	690– 715	.....
Lloydminster	178– 273	.....	174– 257	141– 196	.....
Redwater	913– 925	.....	909– 922	869– 883	.....
Turner Valley	250– 329	.....	264– 329	265– 329	.....
Other Fields	636– 726	.....	604– 689	282– 345	.....
Other Areas	44– 72	.....	34– 59	16– 26	.....
Total	2990–3337	.....	2936–3235	2263–2494	.....
CRUDE OIL PRODUCTION (Bbls.):					
Leduc-Woodbend	1,600,253	11,375,846	1,565,081	1,398,328	8,375,157
Lloydminster	87,112	686,023	88,505	80,460	545,264
Redwater	2,558,146	15,245,404	2,507,325	2,856,051	15,098,190
Turner Valley	198,528	1,781,788	203,112	235,756	1,991,973
Other Fields and Areas	1,335,624	7,200,843	1,282,388	568,628	2,774,403
Total	5,779,663	36,289,904	5,646,411	5,139,223	28,784,987
Add Shipment from Saskatchewan	111,309	779,292	106,304	65,637	445,860
Total for Disposal	5,890,972	37,069,196	5,752,715	5,204,860	29,230,847

This summary of Alberta statistics through August, 1952, was prepared by The Petroleum & Natural Gas Conservation Board, Calgary, Alberta.


GAS FIELDS
OIL FIELDS
RAILROADS
OIL PIPE LINE
GAS PIPE LINE
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MONTANA
IDAHO
WASHINGTON
UNDER CONSTRUCTION
INTERPROVINCIAL PIPE LINE
PROPOSED
EDMONTON
CALGARY
RED DEER
LETHBRIDGE
MEDICINE HAT
PEACE RIVER
GRANDE PRAIRIE
ATHABASKA TAR SANDS
FORT ST. JOHN
COLUMBIA RIVER
FRASER RIVER


Oil and Gas
In Western Canada
CHURCHILL RIVER
LAC LA ROUGE
SNOW LAKE
FLIN FLON
THE PAS
LAKE
WINNIPEG
STURGEON R.
SASKATCHEWAN RIVER
CARROT RIVER
PRINCE ALBERT
MELFORT
SASKATCHEWAN
MANITOBA
MAIDSTONE
LEASK
NORTH BATTLEFORD
EAGLE HILLS
WILKIE
BRUNO
SASKATOON
PERDUE
VISCOUNT
LANIGAN
RIVERHAY
DELISLE
YORKTON
POAM LAKE
YOURG
WATROUS
HANLEY
PLENTY
HARRIS
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STRASBOURG
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ESTERHAZY
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NEUDORF
EYEBROW
LUMSDEN
ABBEY
CABRI
QU'APPELLE
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MORSE
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MARYFIELD
VIRDEN
VIRMANEGA
SOURIS
BRANDON
GLENBORO
SOMERSET
ROLAND
MANITOU
NORDEN
MINTO
BALDUR
BOISSEVAIN
CRYSTAL CITY
MELITA
ORBOW
PIERSON
SOURIS VALLEY
WASKADA
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district of northeastern British Columbia and northwest Alberta to the Pacific Northwest. In this area, engineers estimate, about 1.3 trillion cubic feet of gas reserves have been proven, by far the larger proportion of this figure being in the huge Fort St. John field northwest of Dawson Creek and which was discovered in March of this year.

This field, incidentally, has been mentioned as being perhaps second only to the large Pincher Creek field situated in southwest Alberta. A pipe line route between the Peace River area and the Pacific Northwest already has been surveyed and if approval is obtained from the U. S. Federal Power Commission, a line will be laid into the Washington-Oregon area.

Promising finds have been made in the medium- and heavier-gravity crude areas of Saskatchewan. One of the most significant of these discoveries was Tidewater's Eastend strike in the Saskatchewan portion of the Williston Basin. This discovery, producing from 4740 to 4818 feet, flowed initially at an indicated rate of 800 barrels per day from the Jurassic lime.

In southwest Manitoba, several new finds of light gravity oil have been made in the Madison lime and, with shipments of crude recently started from the Virden field to the Interprovincial Pipe Line, it is expected that development work will pick up materially, now that a market outlet has been established.

Finding a steady, year-round outlet for crude and products has become an increasingly important problem to Canadian oil producers. This year, however, has seen the realization, or at least partial realization of an alleviation of the problem. Expansion of the Interprovincial Pipe Line system with looping, adding of pump stations and increasing of storage facilities has meant that by next spring, demand on the Prairie provinces and Ontario region should raise production to around 230,000 barrels daily.

Of great interest to the Canadian oil industry this year was the starting of construction on the Trans Mountain 24-inch crude line which, with recently announced additional capacity, initially will permit the moving of 120,000 barrels daily, with an ultimate capacity of 200,000 barrels daily. Expansion of British Columbia refineries currently is under way and, at this writing, announcement has just been made by General Petroleum Corporation that it will build a 35,000-barrel-a-day refinery at Ferndale, Washington, to handle Canadian crude, probably by the fall of 1954, that will cross the border in a branch from the Trans Mountain line.

Reflecting the demand for petroleum products in the Pacific Northwest, Imperial Oil, in September, began the first of an expected average of 5000 barrels per day shipments of crude, by tank car, from the Leduc area to Vancouver. Rail shipments will continue until the Trans Mountain line is completed. It represents the first time that prairie crude has reached a British Columbia refinery.

Of pride to Canadians is the fact that, with the completion of the Trans Mountain line next fall, Canada will have been the first to bridge the continent with a transcontinental system for moving crude or products to either coast. It is considered to be of strategic importance the fact that in the event of all-out war or other emergency, the fields of Western Canada will be able to move crude in either or both directions.

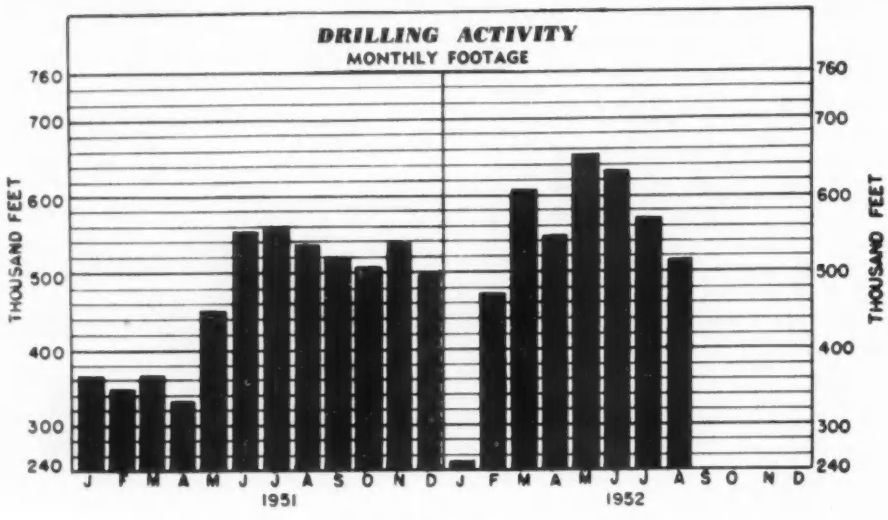
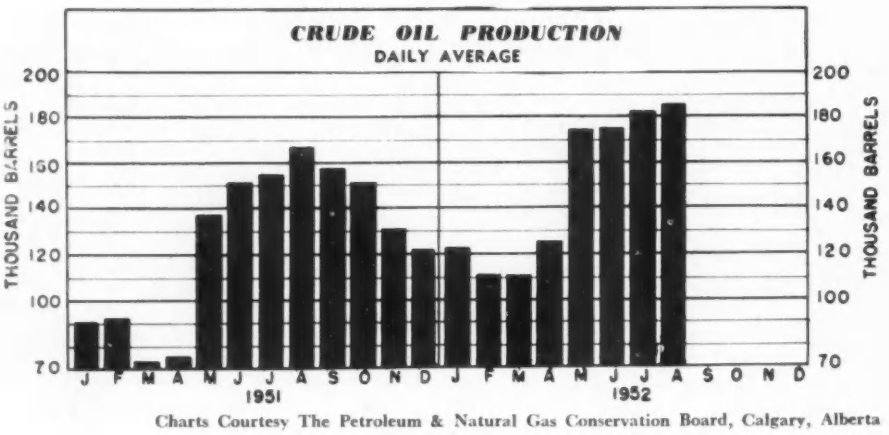


FIGURE 2.



Charts Courtesy The Petroleum & Natural Gas Conservation Board, Calgary, Alberta

FIGURE 3.

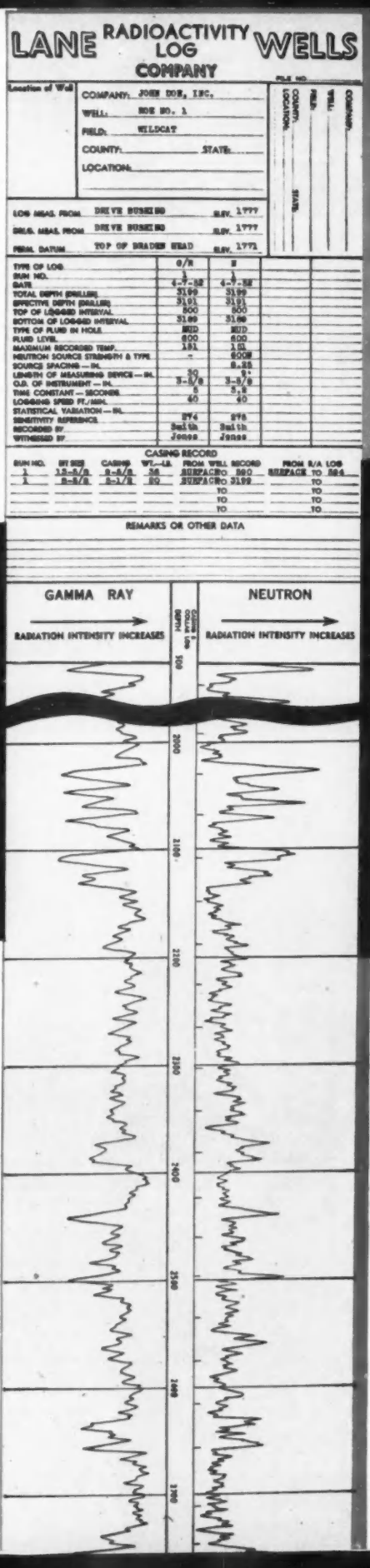
Figures 2 and 3 show Alberta drilling activity and crude production for the past 20 months. Steadily mounting crude output reached an all-time high in August, 1952, of 186,440 barrels daily, but was expected to follow the usual seasonal dip for the winter season when tanker traffic is finally halted by freezing of the Great Lakes. Footage drilled in August reflects retarding effect of steel shortage brought on by U. S. steel strike.

Authorities close to the Canadian oil picture are of the opinion that with a continued strong market demand and with availability of tubular goods next year will see even still greater increases in production, number of wells completed and money spent in exploration and development.

ACKNOWLEDGMENT

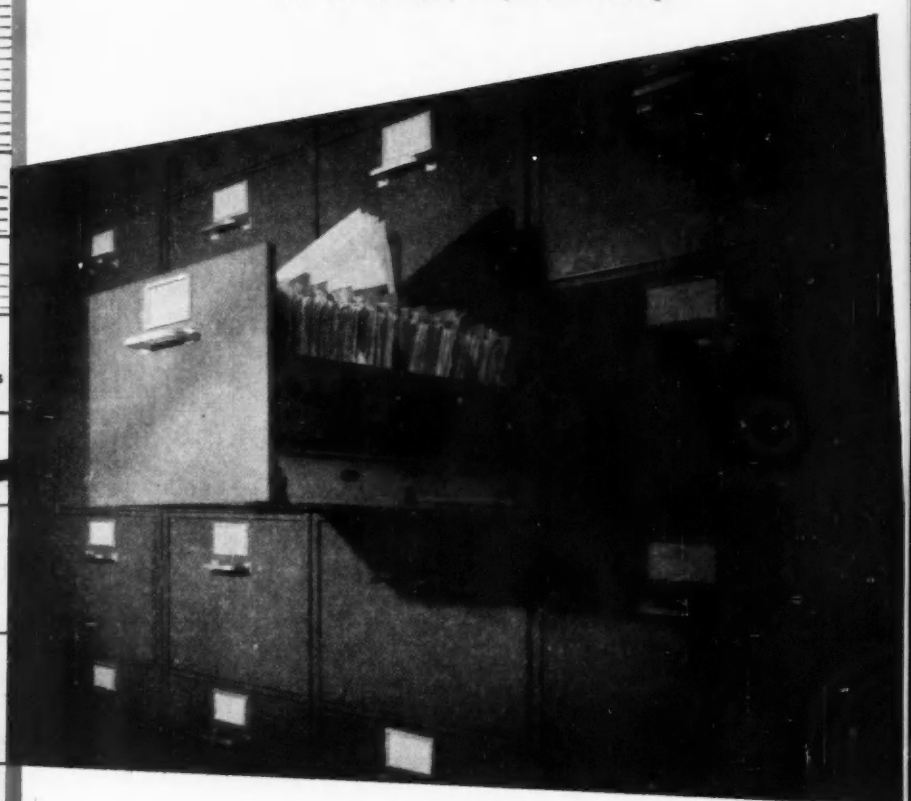
WORLD OIL gratefully acknowledges the assistance and cooperation of the following for much of the data presented in this special Canadian Issue: The Petroleum & Natural Gas Conservation Board, Calgary; Imperial Oil Limited; *The Daily Oil Bulletin*, Calgary; Nickle Map Service, Calgary; Western Canada Petroleum Association, Calgary; Petroleum and Natural Gas Division, Canadian Bank of Commerce, Calgary; also various oil companies, associations and individuals who generously assisted in the assembling of data concerning Canada's oil industry operations.

A tabular list of the principal oil and gas fields of Western Canada on Pages 290, 292, 296.



A most important feature of this log isn't on it...

IT'S BEHIND IT!



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Principal Western Canada Oil Fields, 1952

Tabulated list of principal western Canada oil fields, listed in the order of their discovery dates. To obtain productive acreage of fields, multiply number of wells by 40 acres, the pattern followed in all but heavy oil fields. Heavy oil areas usually are drilled on 10- or 20-acre spacing patterns. In numerous fields, pay thickness given (particularly D2 and D3 zones) represents only the penetration into the particular zone.

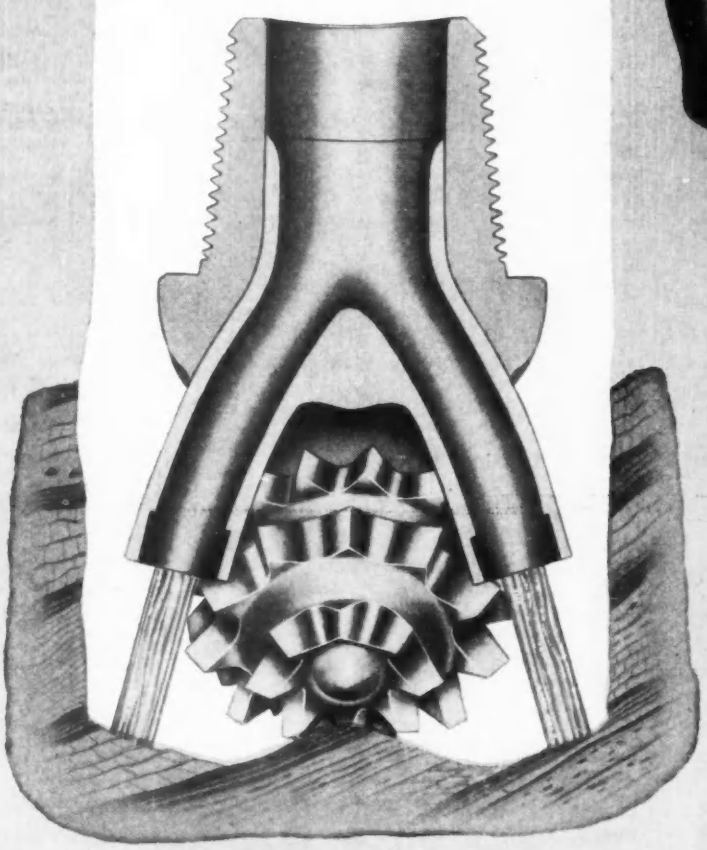
FIELD	Province	Location	Discovery Year	Average Depth	Reservoir Formation	Age of Producing Horizon	Pay Zone Average Thickness	Gravity Degrees API	Oil Production During August, 1952	Number Wells Producing	Number Wells Producible	Rigs Drilling (Oct., 1952)	Remarks
Turner Valley	Alta.	40 mi. SW Calgary	1914	2500	Sandstone	Cretaceous	15	35-59	232,183	250	329	..	Field is principal supplier of gas to Calgary.
			1924	4000-6000	Dolomite	Mississippian	106						
			1936	6000-9600		Mississippian	70						
Norman Wells	NWT	850 mi NW Edmonton	1920	1500	Limestone Reef	Devonian	425	38	n. a.		61	..	Northernmost Devonian reef field.
Princess Brooks	Alta.	140 mi. SE Calgary	1939	3250	Sandstone	Cretaceous	12	25-33	6,464	5	14	..	.....
			1942	3310	Limestone	Mississippian	12						
			1944	3975	Dolomite	Devonian	32						
East Edmonton	Alta.	3 mi. E. Edmonton	1951	3700	Sandstone	L. Cretaceous	28	26	936	2	2	1	.....
Skaro	Alta.	40 mi. NE Edmonton	1951	3610	I. S.	Dev. (Fragmental)	n. a.	36	503	1	2	1	.....
Coutts	Alta.	55 mi. SE Lethbridge	1951	2600	Sandstone	L. Cretaceous	n. a.	28	.....	..	1	..	.....
Ft. St. John	B.C.	50mi. W Dawson Creek	1951	5635	Sandstone	Permo-Penn	n. a.	38	.....	..	..	..	Standing.
			1952	3130	Sandstone	Cadomin.	n. a.	40	.....	..	..	..	Capped as gas well.
			1952	(4360) (4495)	n. a.	Triassic	n. a.	37-40	.....	..	..	..	Capped as gas well.
Lloydminster	Alta.	145 mi E Edmonton	1929	2000±	Sandstone	Cretaceous	15-30	13-16	87,112	178	275	..	Heavy oil production.
Wainright	Alta.	40 mi. SW Lloydminster	1926	2000±	Sandstone	Cretaceous	..	14-20	761	3	14	..	Heavy oil production.
Vermillion	Alta.	30 mi. W Lloydminster	1939	2000±	Sandstone	Cretaceous	..	15	2716	14	36	..	Heavy oil production.
Lloydminster	Sask.	Alb.-Sask.Border	1929	2000±	Sandstone	Cretaceous	15-30	13-16	63,049*				
Dina	Sask.	Alb.-Sask.Border	1929						4,122*			8±	Heavy oil production
Lone Rock	Sask.	20 mi. SE Lloydminster							42,107*				
Maidstone	Sask.								1,418*				
Taber	Alta.	35 mi. E Lethbridge	1942	3000-3200	Sandstone	Cretaceous	35	18-23	6,500	10	21	..	.....
Conrad	Alta.	45 mi. SE Lethbridge	1944	3100	Sandstone	Jurassic	10	26	11,429	15	17	..	.....
Jumping Pound	Alta.	20 mi. W Calgary	1944	10000	Limestone	Madison	120	50-55	4,615	84	46	3	Gas-distillate field.
Leduc-Woodbend	Alta.	20 mi. SW Edmonton	1947	5000 (D 2)	Dolomite	Devonian	30	39-41	558,263	491	524		
			1947	5300 (D 3)	Limstone Reef	Devonian	38		1,019,262	455	461	35	Productive limits still being extended.
			1950	4195	Sandstone	L. Cretaceous	?		25,443	26	30		
Redwater	Alta.	30 mi NE Edmonton	1948	3200 (D 3)	Limestone Reef	Devonian	200	34-36	2,558,146	913	925	1	Limits of field fairly well defined.
Pincher Creek	Alta.	50 mi. SW Lethbridge	1948	12000	Limestone	Madison	400	Dist.	.....	...	2	2	Gas-distillate producing structure.
Stettler	Alta.	93 mi SE Edmonton	1949	4100	Sandstone	L. Cretaceous		28	1,309	2	5	4	Development continuing.
				5100 (D2)	Dolomite	Devonian	50	31	19,904	40	40	..	.....
				5400 (D3)	Limestone Reef	Devonian	50	31	12,193	19	20	..	.....
Normandville	Alta.	220 mi. NW Edmonton	1949	6700	Limestone Reef	Devonian	30	39	1,319	1	1	..	Productive limits not yet defined.
Barrhead	Alta.	55 mi. NW Edmonton	1949	4000	Limestone	Madison	130	22-24	.....	..	..	..	Two-well find; not producing at present time.
Bon Accord	Alta.	23 mi. N Edmonton	1949	3600 (D2)	Dolomite	Devonian	40	34	10,741	9	9	1	D3 zone water bearing.
Golden Spike	Alta.	16 mi. W Edmonton	1949	(D2)	Dolomite	Devonian	..	34-38	3,067	2	2	..	D3 zone thickness in excess of 540 feet.
			1949	5950 (D3)	Limestone Reef	Devonian	540	38	156,699	8	8	..	.....
			1951	4630	Sandstone	L. Cretaceous	..	35	.....	..	..	..	.....
Excelsior	Alta.	18 mi. N Edmonton	1949	3840 (D2)	Dolomite	Devonian	40	36-37	96,559	34	35	..	.....
Campbell	Alta.	8 mi. NW Edmonton	1949	3700	Sandstone	L. Cretaceous	30	31-35	3,993	14	18	..	D2 & D3 zones not productive.
Whitemud	Alta.	10 mi. SW Edmonton	1949	4000	Sandstone	L. Cretaceous	..	35-39	1,672	4	4	..	.....
Joseph Lake	Alta.	20 mi. SE Edmonton	1949	3300	Sandstone	Viking Sand (Cret.)	15	38	75,596	81	81	1	Productive limits not yet entirely defined.
Acheson-Stony Plain	Alta.	8 mi. W Edmonton	1950	4320 (D2)	Sandstone	L. Cretaceous	..	37-38	2,753	7	7	..	
				5000	Limestone Reef	Devonian D2	120	36	7,967	7	7	2	Productive limits not yet defined.
						D3	n. a.	..	193,073	78	78		
Big Valley	Alta.	85 mi. NE Calgary	1950	(D2)	Dolomite	Devonian	60	33	62,272	29	30	2	Productive limits undefined.
				5400 (D3)	Limestone Reef	Devonian	30	..	9,928	7	7	..	
Whitelaw	Alta.	260 mi. NW Edmonton	1950	3815	Sandstone	Permo-Penn	250	28	526	1	1	..	New producing zone I.P. 640 B/D.
Duhamel	Alta.	50 mi. SE Edmonton	1950	4500 (D2)	Dolomite	Devonian	33	34	13,671	8	8	1	.....
Heart's Hill	Sask.	85 mi. SE Lloydminster		4800 (D3)	Limestone Reef	Devonian	30	..	23,531	11	12	..	.....
			1950	2685	Sandstone	L. Cretaceous	10	14	.....	1	1	..	Significant step-out for heavy oil area.
Spring Coulee	Alta.	30 mi. SW Lethbridge	1950	6000	Limestone	Madison		36-39	475	4	4	1	.....
Camrose	Alta.	42 mi. SE Edmonton	Jan. '51	3235	Sandstone	Viking Sand (Cret.)	7	38	43,116	40	46	4	.....
Drumheller	Alta.	65 mi. NE Calgary	1950	4450	Sandstone	L. Cretaceous	40	32	635	2	3	..	I.P. Cret. 195-200 B/D.
			July '51	5420 (D2)	Dolomite	Devonian	30	30	20,213	9	9	..	I.P. Dev., 1000 B/D. .....

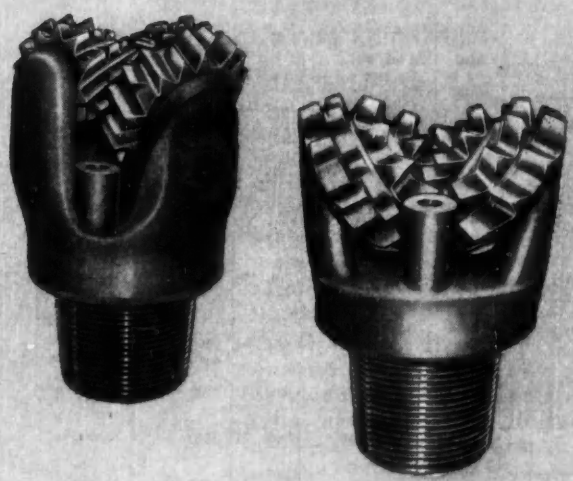
* CONTINUED ON PAGE 292.

H. C. SMITH "Jet-Action" BITS

hit the bottom of the hole... not the walls!

this cutaway shows why





THIS cross-section of an H. C. Smith jet-action bit clearly shows how the angle of the nozzles directs a powerful stream *downward*, against the *bottom* of the hole. The scientifically engineered shape of the water course diverts and divides the mud flow with minimum change of direction, practically eliminating turbulence, and allowing the mud stream to hit the bottom with maximum force, flushing away the cuttings and keeping the teeth on bottom. That's why these bits produce such excellent footage.

H. C. Smith jet-action Rock Bits with tungsten-carbide inserts, indicated in black in the illustration, are known as the "Hydro-Jet" series. Their slightly higher price is reflected in longer life, since these nozzle inserts will outlast the bit teeth.

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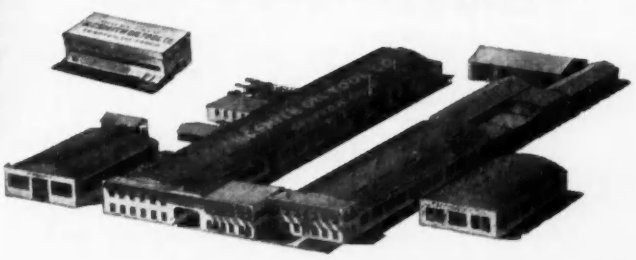
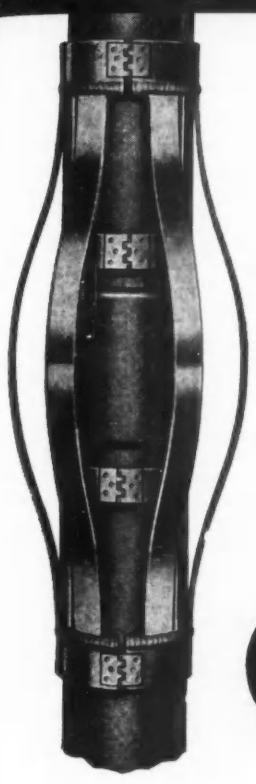


Principal Western Canada Oil Fields, 1952—Continued

Tabulated list of principal western Canada oil fields, listed in the order of their discovery dates. To obtain productive acreage of fields, multiply number of wells by 40 acres, the pattern followed in all but heavy oil fields. Heavy oil areas usually are drilled on 10- or 20-acre spacing patterns. In numerous fields, pay thickness given (particularly D2 and D3 zones) represents only the penetration into the particular zone.

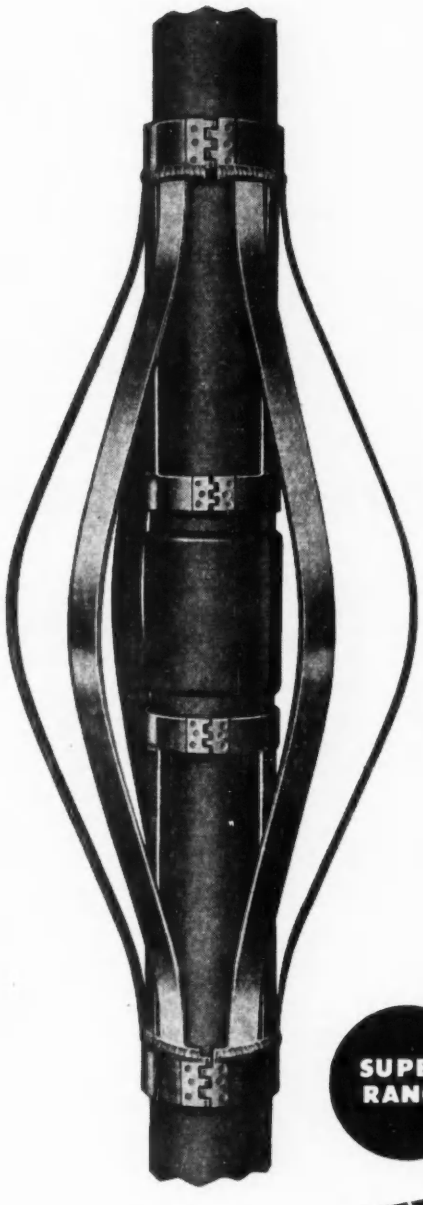
FIELD	Province	Location	Discovery Year	Average Depth	Reservoir Formation	Age of Producing Horizon	Pay Zone Average Thickness	Gravity Degrees API	Oil Production During August, 1952	Number Wells: Producing	Number Wells: Producible	Rigs Drilling (Oct., 1952)	Remarks
Virden	Man.	50 mi. W. Brandon	Jan. '51	2330	Limestone	Mississippian	..	33	n. a.	n. a.	17	3	Significant disc. on Canadian side Williston Basin.
Ellerslie	Alta.	4 mi. S Edmonton	April '51	..	Sandstone	Viking Sand (Cret.)	..	..	....	..	..	..	Productive limits as yet unknown.
				4000	Sandstone	L. Cretaceous	28	28	3,924	6	7	2	
Majeau Lake	Alta.	50 mi. NW Edmonton	May '51	4250	Limestone	Mississippian	85	60	.....	..	..	..	Wet gas discovery; I.P. gas 9½ mill.; Dist. 24 D/B.
Wizard Lake	Alta.	35 mi. SW Edmonton	April '51	4870	Sandstone	L. Cretaceous	35	..	.....	..	..	..	.....
			May '51	5695 (D2)	Dolomite	Devonian	30	..	.....	..	..	..	.....
			May '51	6300 (D3)	Limestone Reef	Devonian	610	38	175,202	23	24	4	Greatest thickness D3 reef pay so far discovered.
Didsbury	Alta.	30 mi. N Calgary	May '51	8180	Limestone	Madison	30	50	.....	..	1	..	.....
Alliance	Alta.	130 mi. NE Calgary	June '51	3150	Sandstone	L. Cretaceous	15	26	3,458	3	4	..	.....
Cessford	Alta.	100 mi. E Calgary	June '51	3280	Sandstone	L. Cretaceous		26	.....	..	3	..	I.P. 190 B/D on swab test.
Pine Lake	Alta.	67 mi NE Calgary	July '51	7050 (D2)	Dolomite	Devonian		36	423	1	1	..	On production.
Glenevis	Alta.	37 mi. NW Edmonton	July '51	4330	Limestone	Mississippian	25	18	.....	..	1	..	Heavy oil I.P. 96 B/D
Belloy	Alta.	235 mi. NW Edmonton	July '51	4110	Sandstone	Permo-Penn	8	28	692	1	1	1	Very thin pay zone.
Bashaw	Alta.	70 mi. SE Edmonton	July '51	5810 (D3)	Limestone Reef	Devonian	19	39	5,547	4	5	..	I.P. on 8-hr. pot. from 19' penetration was 1300 B/D rate.
Neapolis (Olds)	Alta.	35 mi. N Calgary	July '51	8110 (D3)	Limestone Reef	Devonian	20	58	.....	..	1	1	Wet gas discovery. I.P. Dist. 700 B/D; Gas 60 mill. cu. ft.
New Norway	Alta.	50 mi. SE Edmonton	Aug. '51	4660 (D2)	Dolomite	Devonian	100	38	23,351	11	11	..	.....
				4870 (D3)	Limestone Reef	Devonian	60	36	7,021	6	6	..	.....
Coleville	Sask.	15 mi. NW Kindersley	Aug. '51	2720	Sandstone	L. Cretaceous	60	14	45,647	28	57	..	Disc. originally a dev. test; Gas in Viking sand.
Armena	Alta.	30 mi. SE Edmonton	Sept. '51	3260	Sandstone	Viking Sand (Cret.)	20	37	101,814	56	64	3	.....
Caprona	Alta.	90 mi. NE Calgary	Sept. '51	5300 (D2)	Dolomite	Devonian	80	30	28,189	11	12	3	.....
				(D3)	Limestone Reef	Devonian	..	..	334	1	1	3	.....
Glen Park	Alta.	25 mi. SW Edmonton	Sept. '51	6190 (D3)	Limestone Reef	Devonian	15	40	25,862	7	7	2	I.P. of disc. 1760 B/D.
Clive	Alta.	95 mi. NE Calgary	Sept. '51	6200 (D2)	Dolomite	Devonian	12	39	2,569	3	3	1	.....
Dahinda	Sask.	55 mi. SW Regina	Sept. '51	4695	Dolomite	Mississippian	10	20	.....	..	..	1	Disc. well abandoned.
Hamelin Creek	Alta.	265 mi. NW Edmonton	Oct. '51	3780	Limestone	Triassic	n. a.	30	.....	..	1	..	Capped gas well in Gething Sandstone.
Alix	Alta.	100 mi NE Calgary	1952	4740	Sandstone	L. Cretaceous	25	Dist.	.....	..	1	..	Well capped as potentia wet gasser.
Big Valley (North)	Alta.	3½ mi. No. Big Valley Field	1952	5265 (D2)	Limestone	Devonian	90	30.9	2,007	1	1	1	Productive limits not yet defined.
Bonnie Glen	Alta.	34 mi. SW Edmonton	1952	6382 (D3)	Limestone	Devonian	288 Gas Cap. 312 Oil	60 42	84,118	9	9	2	Wet gas flow rate on DST over 10 MMCF/day.
Buck Lake (Minnehik)	Alta.	60 mi. SW Edmonton	1952	6730	Limestone	Madison	35	Dist.	.....	..	1	1	I.P. 14 MMCF/D. rec'd 4 bbl. d'st. per MMCF/gas
Buford	Alta.	3 mi W Leduc	1952	5334 (D2)	Limestone	Devonian	10	Dist.	.....	..	1	..	Also found gas in L.Cret.
Camrose (New Pool)	Alta.	2 mi. S Camrose Field	1952	3230	Sandstone	Viking	15	36–38	n. a.	..	n. a.	..	New pool discovery.
Camrose (New Pool)	Alta.				Sandstone	Viking	..	n. a.	n. a.	..	n. a.	..	New pool discovery.
Camrose (New Pool)	Alta.				Sandstone	Viking	..	n. a.	n. a.	..	n. a.	..	New pool discovery.
Cessford (Nestor)	Alta.	100 mi NE Calgary	1952	2920	Sandstone	Basal Colorado	11	18.1	.....	..	1	1	Zone not fully penetrated
Chancellor	Alta.	50 mi. E Calgary	1952	4765	Sandstone	Sunburst	n. a.	35	.....	..	1	1	Currently testing Sunburst
				4800	Limestone	Madison	n. a.	30	.....				Madison indicated I.P. 240 B/D.
Chauvin	Alta.	190 mi. NE	1952	1990	Sandstone	Colony (Cret.)	n. a.	25	.....	..	1	..	Also show oil in Sparky S. S. below Colony.
		8 mi. W Sask. border	1952	2145	Sandstone	L. Cretaceous	+10	23	.....	..	1	..	Indicated I.P. 120 B/D. Cret. gas below 2120 est. 6 MMCF.
Clive	Alta.	New zone	1952	6300	Limestone (D3)	Devonian	25±	39	1,375	1	1	1	Well is dual completion, D2-D3.
Cold Lake	Alta.	20 mi NE Bonnyville	1952	965	Sandstone	Colony (Cret.)	n. a.	13	.....	..	1	3	.....
Drumheller (New Area)	Alta.	6 mi. W Drum. Field	1952	5510	Limestone (D2)	Devonian	35	41	n. a.	1	1	..	Indicated I.P. of 1220 B/D.

■ CONTINUED ON PAGE 296.



20 RANGE

25 RANGE



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Super-Range HINGE LOK
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PRODUCT NO. 9114

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BE SURE YOU GET

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THROUGHOUT THE ZONE

TO BE CEMENTED

Always *pulled*—never pushed

Baker HINGE-LOK Casing Centralizers are always "pulled" during upward or downward travel of the casing in the well. This feature is important when the centralizer passes through any tight spots in the hole—and is especially advantageous when reciprocating casing during cementing operations.

Call Baker for Centralizer service

Any Baker representative, or office, is ready to give you the kind of service every operator appreciates—sincere, courteous assistance to help you get successful "first-time" cementing results.

BAKER OIL TOOLS, INC.

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Principal Western Canada Oil Fields, 1952—Continued

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FIELD	Province	Location	Discovery Year	Average Depth	Reservoir Formation	Age of Producing Horison	Pay Zone Average Thickness	Gravity Degrees API	Oil Production During August, 1952	Number Wells		Rigs Drilling (Oct., 1952)	Remarks
										Producing	Producible		
Duhamel	Alta.	New Zone	1952	4295	Sandstone	L. Cretaceous	n. a.	35	.....	..	1	..	Well also has D2 & D3 prod.
Ellerslie	Alta.	New Zone	1952	4515	Limestone (D2)	Devonian	n. a.	36-39	.....	..	..	1	Testing.
Fiveland	Alta.	40 mi. SW Edmonton	1952	6850	Limestone (D3)	Devonian	253	Wet Gas -Dist.					
Lake St. Ann	Alta.	30 mi. NW Edmonton	1952	4570	Limestone (D1)	Devonian	240 35	40.5 23	.....	..	1	1	I.P. 1058 B/D thru choke.
Legal	Alta.	23 mi. N. Edmonton	1952	2815	Sandstone	Viking	n. a.	n. a.	.....	..	1	..	First commercial D1 oil prod.—I.P.75 B/D.
Malmo	Alta.	50 mi. SSE Edmonton	1952	4950	Limestone (D2)	Devonian	80	38-39	19,079	8	8	4	Disc. well dual compl.—I.P. 3520 B/D.
Malmo	Alta.		1952	5250	Limestone (D3)	Devonian	65	34-35	8162	7	7		
Malmo	Alta.		1952	4715	Sandstone	L. Cretaceous	n. a.	33	.....	..	..		Disc. well also found Dev. oil.
Mandy Lake	Alta.	22 mi. SE Edmonton	1952	3268	Sandstone	Viking	15	38-39	.....	..	1	1	Flowed up to 5 MMCF/D from 8' gas cap.
Nevis	Alta.	90 mi NE Calgary	1952	5520	Limestone (D2)	Devonian	115	Gas-Dist.	.....	..	4	2	Large gas-dist. reserve; has thin oil column.
			1952	5545	Limestone (D2)	Devonian	10+	32-33	.....	..	1		I. P. 40 Bbl. hr: also found 19' gas-dist. zone.
Pigeon Lake	Alta.	35 mi. SW Edmonton	1952	4477	Sandstone	Basal Quartz (L. C.)	n. a.	35	.....	..	1		Also good gas flow.
			1952	6395	Limestone (D2)	Devonian	n. a. 254	Wet Gas-Dist.	.....	..	..		
			1952	6670	Limestone (D3)	Devonian	300	41.5	2,625	1	1	2	Important link in prolific reef trend SW of Edmonton.
Rosenheim	Alta.	180 mi. NE Calgary	1952	2390	Sandstone	Colony (Cret.)	n. a.	12-13	.....	..	1	..	I.P. 120 B/D on pump.
Rycroft	Alta.	62 mi. SW Peace River	1952	4200	Sandstone	Cadomin	15	19	.....	..	1	..	Well completed as gas well.
Saddle Lake	Alta.	80 mi. NE Edmonton	1952	1610	Sandstone	L. Cretaceous	n. a.	12	.....	..	1	1	Heavy oil disc. plus some gas.
St. Albert	Alta.	6 mi. NW Edmonton	1952	3800	Sandstone	L. Cretaceous	7	36	1,160	1	1	..	I.P. 40-50 B/D.
Sturgeon Lake	Alta.	70 mi. S Peace River	1952	8914	Limestone (Reef)	Devonian	90	35	.....	..	1	2	Significant new reef discovery. Indicated 700 B/D thru 5/16" choke.
Three Hills	Alta.	57 mi NE Calgary	1952	4810	Limestone	Madison	25	28	2,007	1	1	1	I.P. 61 B/D through 1/2" choke.
Taber	Alta.	130 mi SE Calgary	1952	3150 & 3180	Sandstone	L. Cretaceous	n. a.	24.5	.....	..	1	..	Two sands separated by shale break.
Twining	Alta.	45 mi. NE Calgary	1952	5355	Limestone	Madison	40	32	1,011	1	1	..	I.P. 32 B/D. Also found 38° oil in D2 Devonian.
Vulcan	Alta.	60 mi. S Calgary	1952	5339	Sandstone	L. Cretaceous	12	35	.....	..	1	1	Still testing (Same well)
Vulcan-Nanton	Alta.	50 mi SE Calgary	1952	5491	Limestone	Madison	15	30	.....	..	..	..	
Antelope Lake	Sask.	35 mi W Swift Current	1952	6656	Limestone	Madison	11	33	661	1	1	1	I.P. thru 1/64 choke 15 B/hr. gross; cut 82%.
Arelee	Sask.	35 mi. SE No. Battleford	1952	3450	Sandstone	Jurassic	15	19	.....	..	1	1	Swabbed at 120 B/D rate.
Battle Creek	Sask.	45 mi. S Maple Creek	1952	2000	Sandstone	L. Cretaceous	10	12	.....	..	..	..	Operations suspended.
Buffalo Coule	Sask.	4½ mi. NE Coleville Field	1952	4415	Limestone	Madison	n. a.	15	.....	..	..	..	Capped as gas well in Jurassic.
Cantuar	Sask.	19 mi. NW Swift Current	1952	2610	Sandstone	Cretaceous	20	10.1	.....	1	3	2	.....
Dewar Lake	Sask.	20 mi. NW Kindersley	1952	3200	Sandstone	L. Cretaceous	n. a.	23.1	.....	..	3	1	Development continuing in area.
			1952	3295	Sandstone	L. Cretaceous	n. a.	11.6	.....	..			
Eastend	Sask.	15 mi. SW Shaunavon	1952	2700	Sandstone	L. Cretaceous	n. a.	16	.....	..	1	..	Prep. to put on pump.
Driver	Sask.	4 mi. W Coleville Field	1952	4740	Limestone	Jurasic	n. a.	23	.....	..	..	..	Disc. well testing. Tests indicate 800 B/D.
Fosterton	Sask.	28 mi. NW Swift Current	1952	2255	Sandstone	Viking	22	33	.....	..	1	..	Disc. shut in due to high G/O ratio.
Hoosier	Sask.	38 mi. NW Kindersley	1952	3065	Sandstone	L. Cretaceous	50	24	685*	1	9	1	I.P. 300 B/D thru 1/4" choke.
Ratcliffe	Sask.	35 mi SSW Weyburn	1952	2810	Sandstone	L. Cretaceous	n. a.	15-16	520*	..	2	..	I.P. disc. well 52 B/D.
St. Eloi	Sask.	5½ mi. SE Coleville Field	1952	6360	Limestone	Madison	n. a.	35	.....	..	..	1	Acidizing & swab testing.
St. Florence	Sask.	7 mi. W St. Eloi Disc.	1952	2730	Sandstone	Mississippi	n. a.	11	.....	..	..	..	Servicing I.P. indicates 50 B/D.
Success	Sask.	10½ mi. E Fosterton Field	1952	2710	Sandstone	Mississippi	n. a.	10	.....	..	..	..	Compl. as Cret. gas well I.P. 24 MMCF/D.
Tilston	Man.	65 mi. SW Brandon	1952	3095	Sandstone	L. Cretaceous	n. a.	22.6	.....	..	1	..	.....
Waskada	Man.	35 mi. SE Tilston Disc.	1952	3096	Limestone	Madison	15	33	.....	1	1	..	I.P. 168 B/D gross (19% Cut).
			1952	3022	Limestone	Madison	25	34	.....	..	1	..	Testing.

* Production for July, 1952.

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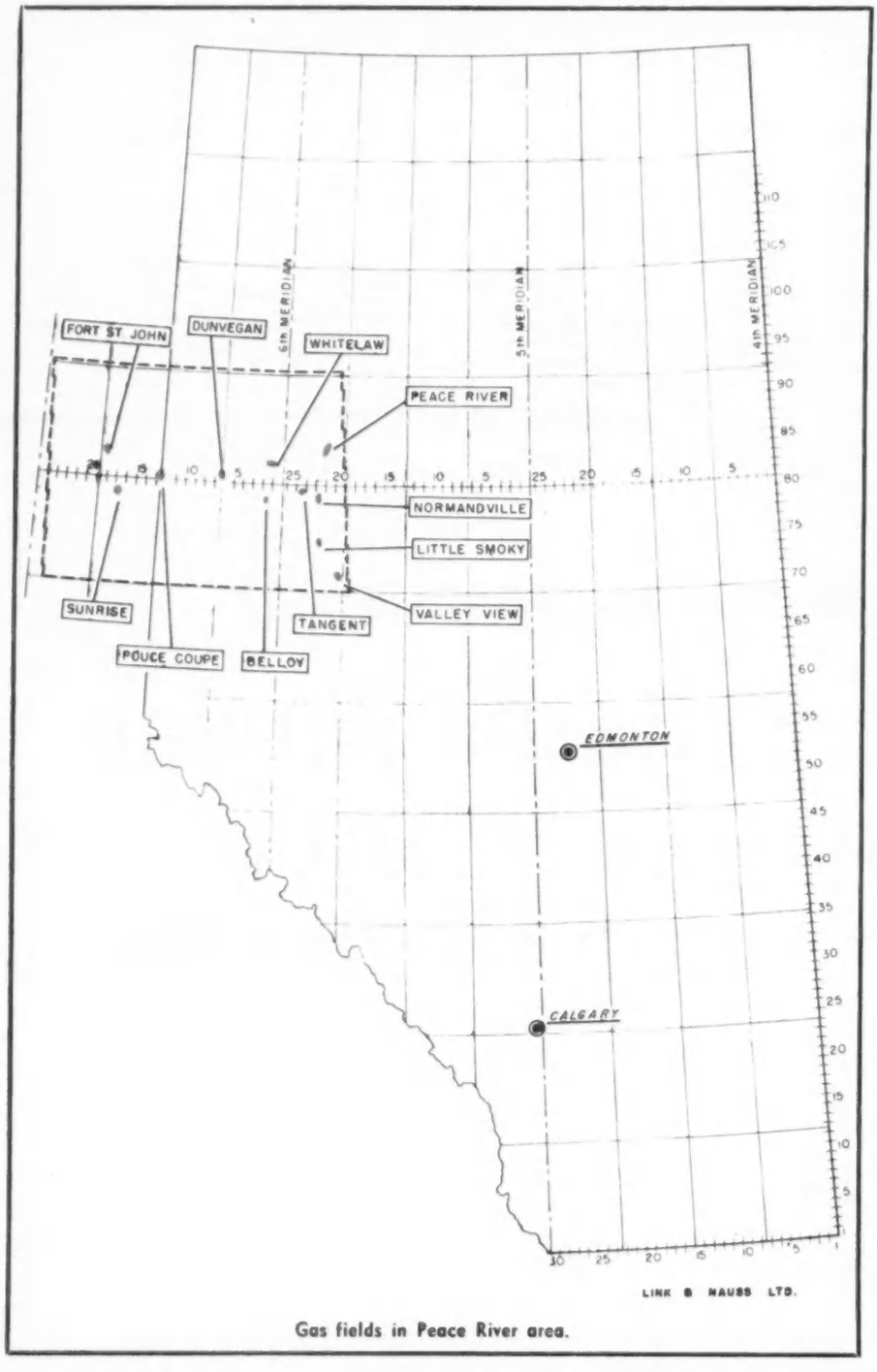


Gas fields in Peace River area.

What Does Peace River Mean to Western Canada?

This province straddling a gas reserve may be good for five trillion cubic feet of gas in three or four years.

By THEODORE A. LINK
Consulting Geologist,
Link & Nauss Ltd., Calgary

INITIAL WELLS in the Peace River area were drilled between 1916 and 1924 along the banks of the Peace River north of Peace River town. About a dozen shallow wells were drilled. All found oil and gas in various amounts.

Farther west in Pouce Coupe district the Northwest Company drilled a well in 1921-1923 and encountered several gas horizons. The well caught fire and was abandoned in 1937. Several wells followed in 1938, 1942, and 1944. This field now supplies gas to the small town of Dawson Creek and production to date has been small. Eleven wells have been drilled in the field; seven are gas wells and four are dry holes.

In 1948 and 1949 Imperial Oil Limited drilled several deep tests which added greatly to geological knowledge of the Peace River area. In one of these wells, Imperial Normandville 1, situated 20 miles south of Peace River, oil was discovered in dolomite of Upper Devonian age. In addition, several shallow horizons were found to contain gas in considerable quantities.

This discovery accelerated somewhat the pace of exploration in this area and many of the major oil companies operating in Alberta applied for and were granted Crown reservations. These reservations extended as far west as the British Columbia-Alberta boundary and as far north as the Alberta-North West Territories boundary.

Drilling on these lands has again contributed to geological knowledge. Of 126 holes completed during the period 1948 to the beginning of October, 1952, 37 have found gas in volume and four have found oil in commercial amounts. Almost all the remainder found gas in small quantities and some have found oil.

The most important discovery made to date in the area is the Fort St. John field in British Columbia. The discovery well was drilled by Pacific Petroleums Ltd. in November of 1951. Since, seven gas wells have been completed and eight wells are drilling, four of which have found commercial quantities of gas.

The structures are gentle anticlines and were discovered originally by surface geological methods, but seismograph surveys and drilling are necessary to define the shape of the struc-

tures at depth. The granting of a permit by the Alberta government to export gas from the Peace River area greatly accelerated the exploration programs there and in British Columbia.

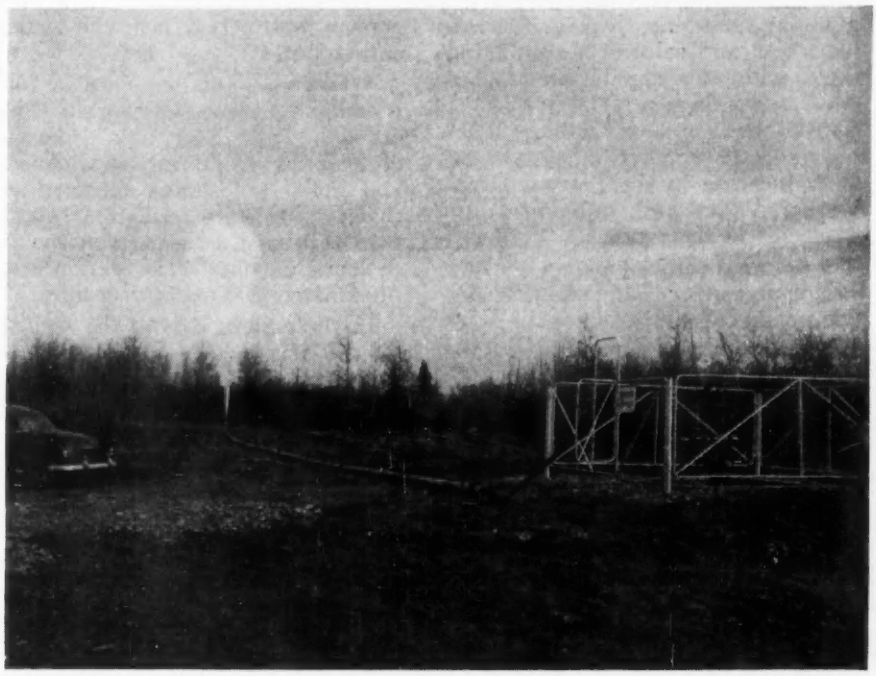
At present, eight drilling rigs are operating in the Fort St. John area. These rigs are largely engaged in drilling extension wells some miles from the present known limits of the pools. The gas reserves in the area have been greatly increased in recent months by the success of an extension well five miles to the southeast of the main Fort St. John field.

A very active drilling program was begun in the entire Peace River region when export was granted in April of this year. This program, now only several months old, should rapidly increase the reserves of the region.

Geological Highlights. Geological highlights of Peace River-British Columbia are:

• Cambrian—In the eastern portions of the Peace River area, the granite wash of the Precambrian is overlain by a standstone and shale section which now is designated as Cambrian in age. Where present, the beds may be up to 100 feet thick. In the greater part of the Peace River area, Cambrian sediments are absent and rocks of Devonian age overlie the Precambrian.

• Devonian—A hiatus occurs between the Precambrian or Cambrian and the overlying Devonian rocks. The Middle Devonian Elk Point formation of the Athabasca-Edmonton-St. Paul region is missing.



Recently-completed well in Fort St. John gas field in British Columbia is given routine blow-down. Well produces from Permo-Pennsylvania formation at 6274 feet.

The Upper Devonian rocks are divisible into four formations: the Woodbend, Winterburn, Wabamun and Exshaw in ascending order, and the upper member of the Beaverhill Lake may be present below the Woodbend. The total thickness of these formations amounts to approximately 2000 feet.

The Woodbend formation may be divided into the Ireton, the Leduc, (if reefal development is present), the Duvernay and Cooking Lake equivalents. Where present, the Leduc is porous and forms an excellent reservoir for the accumulation of oil and gas. The Woodbend formation is present in the eastern portion of the Peace River region in the Normandville-Peace River Town area.

Farther west to the Whitelaw-Dunvegan area it is absent and the Winterburn or Wabamun rests directly on the Precambrian. Where present, the Woodbend has an approximate thickness of 1000 feet.

The Winterburn formation, approximately 200 feet in thickness, is primarily a dolomite with thin silt beds as its top. It extends farther west than the Woodbend; however, in the area of the Spirit River high it is absent and the Wabamun or D-1 formation of dense limestones rests on the Pre-Cambrian. The uppermost formation of the Devonian is the Exshaw, which occurs over the general Peace River area. It is a black, non-calcareous shale commonly containing plant spores. Little is known of the Devonian to the extreme west of the area.

• Mississippian—These strata overlie the Devonian and are divisible into two members: the Rundle and Banff. These members are approximately 1200 feet and 900 feet in thickness, respectively.

The lower member, the Banff, consists of dark green and gray shales, gray fossiliferous limestone and dark gray calcareous shales with some buff granular limestone.

The overlying Rundle or Madison is composed of lithographic and coarsely

Typical drilling operation in heavily forested country west and north of Fort St. John town in northeast British Columbia. In foreground are boxed cores.

granular limestone, gray argillaceous limestone, and calcareous fossiliferous shale with subordinate amounts of chert and anhydrite. The porous sections of the Rundle are capable of acting as reservoir rocks for oil and gas, as is the case in the Pincher Creek, Turner Valley and Jumping Pound gas fields to the south.

• Permo-Pennsylvanian—Rocks of Permian and/or Pennsylvanian age overlie the Mississippian rocks. They consist of coarse dolomitic sandstones, silts, shales and dolomite. The dolomites are oil and gas bearing at Whitelaw and Belloy and are gas bearing at Fort St. John.

This sequence of rocks is unconformable with the overlying Triassic. Permo-Penn sediments cover the entire Peace River area, ranging in thickness from 100 to 500 feet. Their eastern limit occurs near the western end of Lesser Slave Lake.

• Triassic—This sequence of rocks is one of the most prolific gas producers in the Peace River area. It consists of a series of sandstones, dolomitic and shaley sandstones, siltstones and shales with some dolomite. Gas is present in some areas in sandstone and dolomite members. The section is approximately 200 to 300 feet thick.

In the eastern part of the area the Triassic has been bevelled off by erosion until, in the neighborhood of McLennan, the beds truncate against the unconformity.

• Jurassic—The lower Jurassic member (the Nordegg), overlies the Triassic unconformably. This member is approximately 80 feet thick, and consists of dark brown, petroliferous shales with gray argillaceous shales and minor amounts of sandstone. The upper member is dark, hard shale with some glauconite. The Jurassic rocks are also bevelled by erosion, although they extend farther eastward than the Triassic.

• Lower Cretaceous—The Lower Cretaceous sequence of continental and marine sands is divided into the Gething, Loon River formation and Peace River series. Sediments of this age total approximately 1200 feet. Only the lower part of the Peace River series is included in the Lower Cretaceous, although some geologists believe all of the Peace River Series is of Lower Cretaceous age.

The Gething formation is a continental deposit of interbedded sandstones and shales with some coal. It is often a prolific gas horizon with gas present in the top and also near the base. It varies in thickness up to 300 feet. It is in part correlative with the McMurray formation found farther east. The Gething is overlain by the Loon River formation, a series of dark gray marine shales and very fine grained indurated quartz sandstone. The Clearwater shales are probably its eastern extension.

The Loon River is overlain by the Peace River series, consisting of marine and continental standstone and shales. Those members included in the Lower Cretaceous are the Monias sandstone, a glauconitic fine to coarse grained argillaceous sandstone; the Lower Harmon shale and the Notikewin sandstone. The latter is considered at present to mark the top of the Lower Cretaceous.

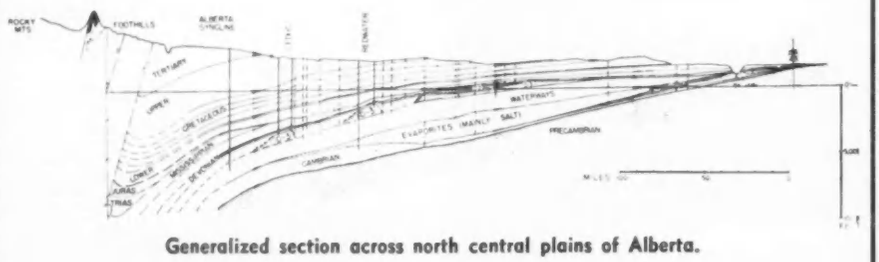
• Upper Cretaceous—These rocks form the present day land surface and include the upper two members of the Peace River formation, the Shaftesbury and Dunvegan formations and, where not removed by erosion, the Kaskapau, Cardium and Wapiabi formations.

The most important gas reservoir is the Cadotte sandstone of the Peace River series. It consists of coarse, well rounded chert and quartz pebbles and fine-grained quartz and chert sandstone. It is approximately 100 feet in thickness. The Dunvegan, a continental sandstone, also contains some gas but is not yet commercially productive.

Prospects for Gas Reserves. One out of five of the recent wells drilled in the Peace River area have been completed as gas wells. This remarkably high average indicates that this region is good gas territory.

The geologist would arrive at the same conclusion from a detailed study

Sedimentary basin and line of cross-section of Alberta and Saskatchewan.



Generalized section across north central plains of Alberta.

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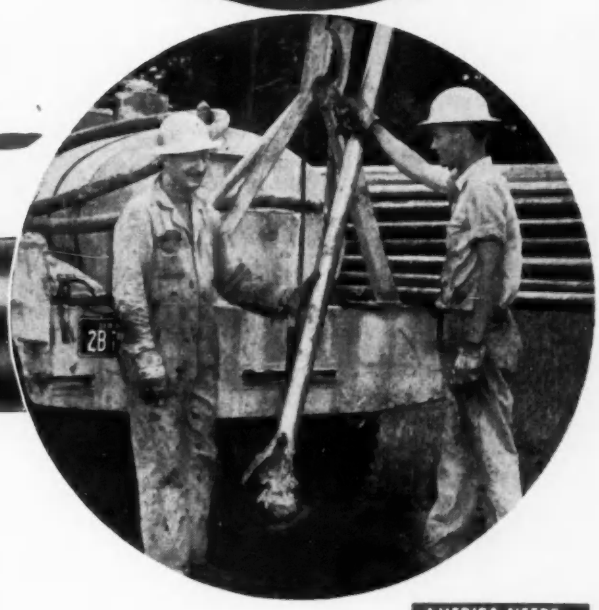

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of the stratigraphic section already described in this paper. There is a thick section of interbedded marine sandstones, shales and porous limestones with numerous unconformities and "pinch-outs." More formations are present in this area than in the Plains Area to the southeast, so that a wildcat well has more prospective producing horizons to explore.

In the Edmonton area, gas horizons are indicated in the Viking sand of Upper Cretaceous age, the Lower Cretaceous sands and the Upper Devonian reef limestones and dolomites. In the Peace River area the gas horizons are the Dunvegan and Cadotte sands of Upper Cretaceous age; the Notikewin, Monias and Gething sands of Lower Cretaceous; the Triassic sandstones, the Permo-Pennsylvanian sandstones and dolomites, the Mississippian and Devonian limestones and dolomites.

In other words, in parts of the Peace River area there are seven geological ages which contain rocks which are potential gas horizons, while in parts of the Edmonton area there are only three.

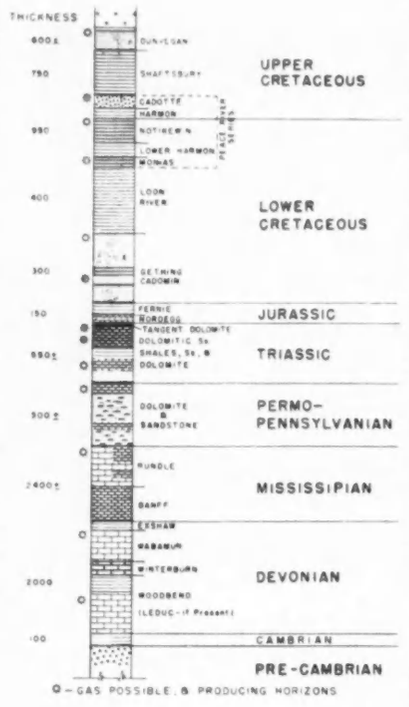
These statistics and geological data seem to indicate that the Peace River area is a better "hunting ground" for gas than other parts of Alberta, and when the exploratory efforts in this area become comparable to that of other parts in Alberta, the possible future gas reserves should be greater per square mile in the deeper portions of the Peace River area.

As pointed out, the thicker the sedimentary column of rock is, the greater are the possibilities of oil and/or gas accumulation.

Approximately 97 percent of the Province of Alberta lies within the Western Canada sedimentary basin area, and the thickness of these rocks increases from east to west, so that the western portion of the Province has the greatest thickness of sedimentary rocks. This is due to the fact that the regional dip (or inclination) of the rocks is to the west and southwest.

The belt or area of greater thickness of sedimentary rocks in western Alberta extends into the adjoining area of northeastern British Columbia, known as the Peace River area, which is the area under consideration from which the transportation of natural gas to markets in and around Vancouver and south thereof to the U. S., is contemplated.

Approximately 2 trillion cubic feet of recoverable natural gas reserves have been discovered in this area



Stratigraphic column of Peace River area.

About the Author

THEO. A. LINK, president and consulting geologist, Link & Nauss Ltd., Calgary, Alberta, was born at Laporte, Ind., Jan. 19, 1897, where he received his high school education. He received his B.S. degree from the University of Chicago in 1918 and his Ph.D. in structural geology nine years later.

Link was assistant geologist, Geological Survey of Canada, Ottawa, Ontario, in 1918; geologist for Imperial Oil Limited and subsidiaries, Western Canada and South America, 1919-1944; assistant chief and chief geologist, Imperial Oil, 1944-1948; and has been consulting geologist, Link & Nauss, since 1948.

within a matter of only a few years, and by the drilling of a relatively small number of exploratory wells.

Based upon experience elsewhere, and in Western Canada in particular during the last five years (i.e. since the discovery of oil at Leduc, Alberta, February, 1947) it seems logical to conclude that natural gas reserves many times more than those already established in this area and the adjacent areas, will be discovered if the present exploratory effort is continued for a reasonable length of time.

In view of the fact that in the area under consideration the sedimentary column is greater, and contains more and thicker potential oil and/or gas reservoirs, the ultimate total gas reserves per acre should be greater in this part of Alberta and northeastern British Columbia than in other parts in the Plains Area.

Despite the fact that a considerable number of holes have been drilled in Western Canada in the search for and the development of gas and/or oil reserves, the number of holes drilled per unit area is not nearly as great as in comparable gas and oil areas of the U. S.

As an example, in Kansas, which has an areal extent one-third as great as the Province of Alberta, more than 75,000 holes have been drilled and approximately 14 trillion cubic feet of natural gas reserves have been established.

In Alberta, after drilling less than 5000 holes, more than 10 trillion cubic feet of gas reserves have already been discovered, and more than half of these reserves were uncovered during the last three to four years.

These figures certainly suggest that eventually the Western Provinces should yield 25 to 50 trillion cubic feet of gas—or even more and, as already suggested, those portions of the Western Sedimentary Basin area with the greater thickness of rock column should be the most prolific, i.e., areas like the Peace River district of Western Alberta and northeastern British Columbia.

If permission to remove gas from this area were given or, if commercial oil were discovered in this area, the increase of exploratory effort would result in the discovery of at least 5 trillion cubic feet of natural gas within a period of three to four years. In addition to that, the natural gas reserves of Western Canada will increase at a greater rate than the market demands (once markets have been established) as has been the case in similar areas in the U. S.

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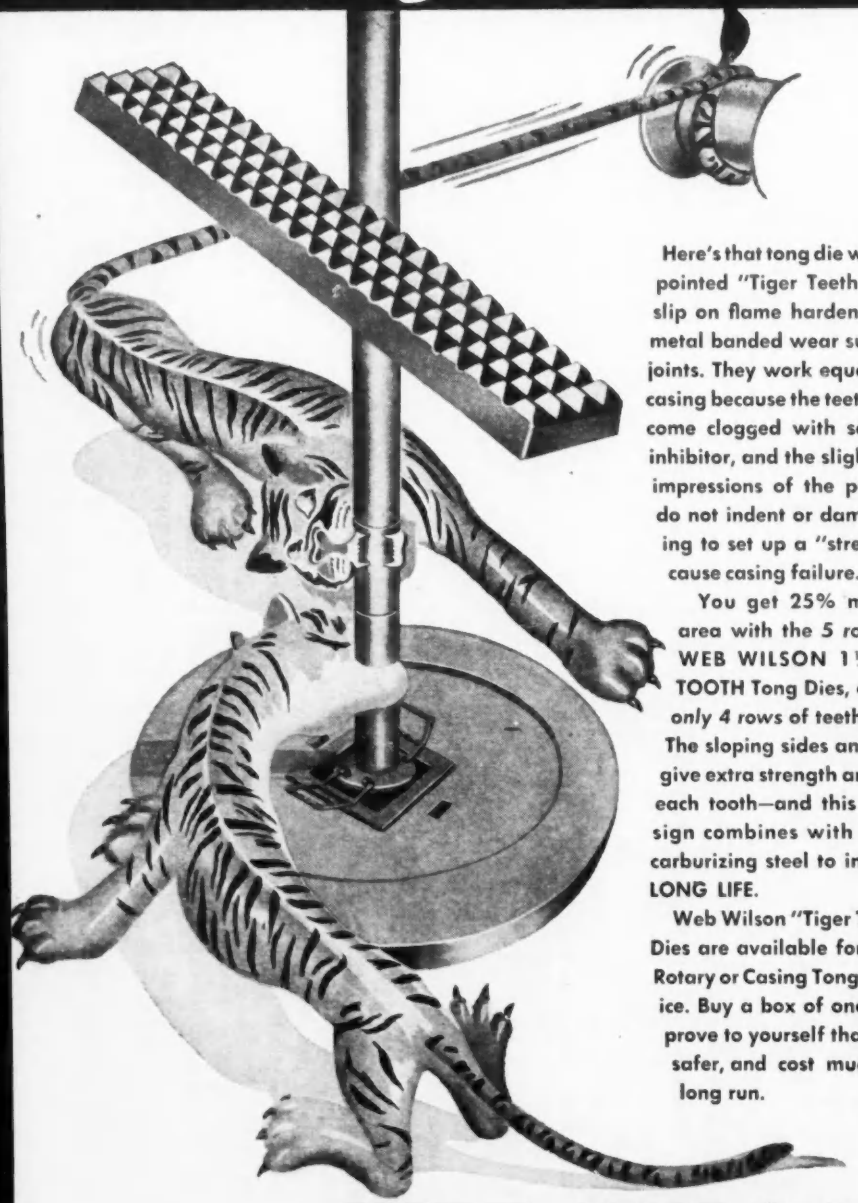

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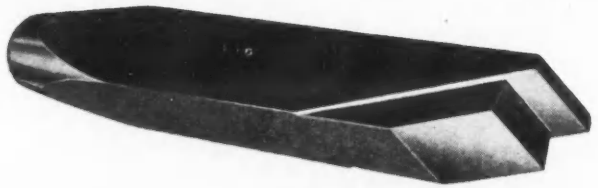

I drive 'em, in and I drive 'em out! And the men who "knock" me most are my best friends. I put up a hard front to give years of service—But I'm softer in the rear end so you can hammer away without having any chips popping off to hit you in the eye—And my overhanging upper lip keeps any pieces of the die from flying around.

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P-S-S-T . . . let me whisper to you Safety Engineers. ★ If you really knew how I cut accident rates you would personally introduce me to every crew on every rig under your eagle eye. Crews *gladly* stop using bolts, cold chisels (or what have you?) when "Jiffy" comes on the job to install and remove tong dies. I keep chips or pieces from flying off hardened tong dies to injure eyes, hands or face, and I save a lot of mashed fingers. ★ Any Web Wilson man has "Jiffy" Tong Die Drivers in his car for immediate delivery—ask him!

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Canadian drilling activity in 1952 was retarded somewhat by a shortage of steel and tubular goods caused by the steel strike. An estimated 14 percent of the drilling rigs are still on the idle list. Here, a rig is erected on a new location in the prolific Bonnie Glen area southwest of Edmonton.

$750,000 a Day Shapes Canadian Oil Future

- **Demand for oil, gas rising.**
- **Production figures spiraling.**
- **Transportation expanding.**
- **Refineries hike throughput.**

By R. H. C. HARRISON
President, Western Canada Petroleum Association, Calgary

To PROPERLY APPRECIATE the oil industry's development in Western Canada during the post-war period and it's impact on Canada's economy, it is necessary to consider the past, present and future demands for crude oil, and the past, present and future sources of supplying its demands.

In 1946, the daily Canadian demand for crude was 222,000 barrels, of which Canadian production was able to supply only 9.4 percent. In 1951, the daily demand increased to 410,000 barrels, with production increased to 133,000 barrels or 32.4 percent of that demand. In 1946, Canadian crude consumption per capita was 6.6 barrels, whereas in 1951 it had increased to 10.7 barrels or something over 60 percent.

During the same period, per capita demand increase in the U. S. was only 30 percent. Due to the increased use of tremendous quantities of crude products in the heating of Canadian homes, in Canadian automobiles, in farm equipment and by industries, the increase in this period was 83 percent, whereas during the same period, demands in the U. S. increased only 43 percent.

At the present time, Western Canada's production is curtailed by proration limiting production to the amount required to meet the demands for crude in those areas where western crude can compete pricewise with crude from other sources.

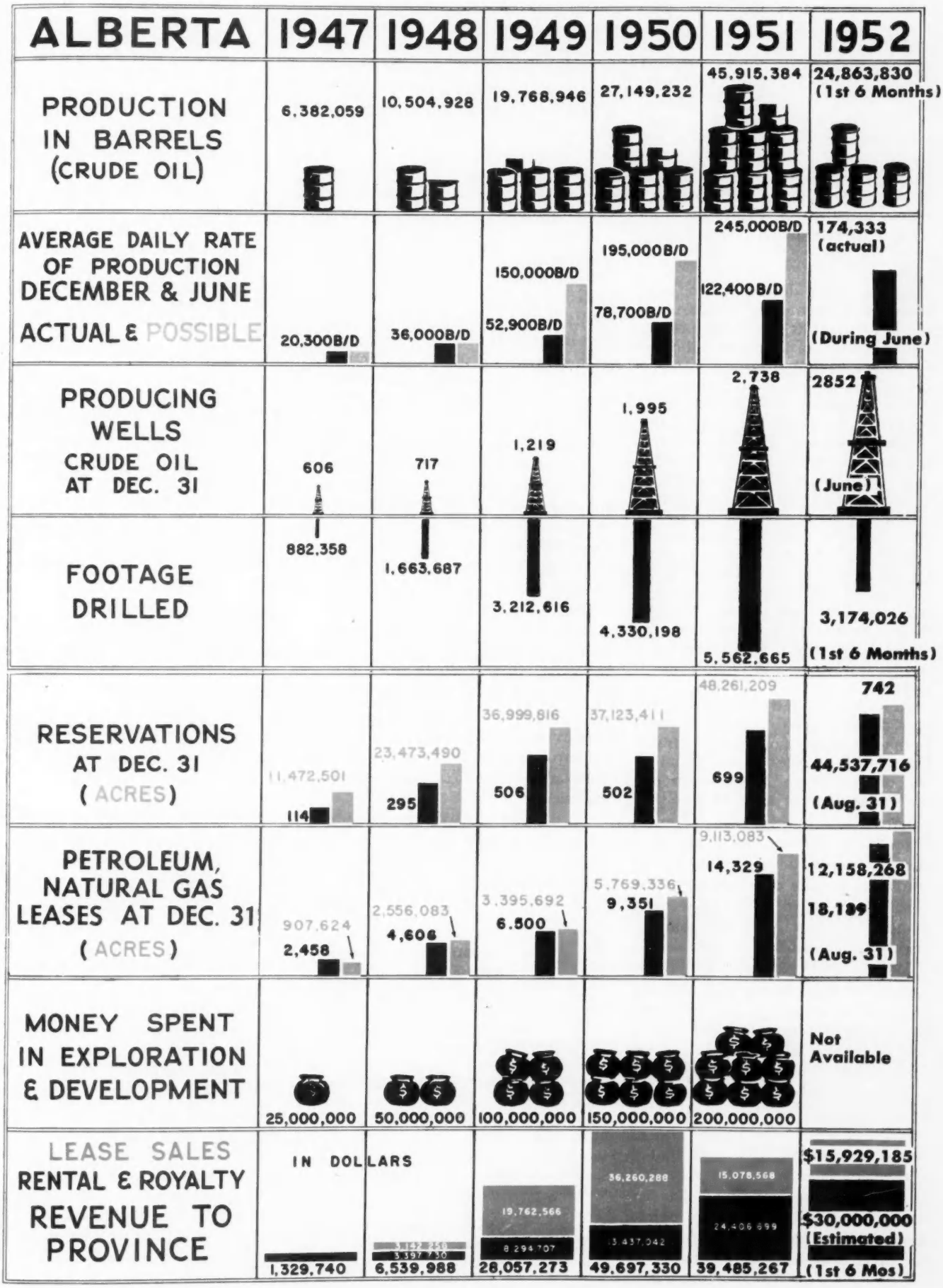
In 1950, the Inter-Provincial Pipe Line was built from Redwater in Northern Alberta to Superior at the head of Lake Superior, from whence tankers carry large quantities to Ontario refineries. The building of this line has enabled Western crude to not only satisfy the prairies' demand for crude but also to transmit crude in sufficient quantities to satisfy more than two-thirds of Ontario refineries' crude requirements and to deliver 4000 barrels daily to a refinery in Wisconsin. It is estimated that the Trans Mountain Pipe Line, presently being constructed from Edmonton to the Pacific Coast, will be in operation by August, 1953, and will result in Western Canada crude supplying the British Columbia crude oil market.

Presently, some 42,000 barrels of crude and finished products are imported. While initial construction plans, including two pump stations, were based on a throughput of 75,000 barrels per day, in the light of new discoveries made in Alberta's oil fields and a consequent upward revision of estimates of production, the company's directors in July, 1952, decided to build a third pump station at the outset. Thus, Trans Mountain initially will be able to handle up to 120,000 barrels of crude oil a day, instead of 75,000 barrels per day as originally scheduled.

In 1951, more than 400,000 barrels of petroleum were required daily in Canada or over a gallon a day per person. This is the highest in the world next to the U. S. per capita demand, and over exceeds by three and one-half times the per capita demand consumption in the British Isles. Canada has one vehicle for every six people. Oil is used widely for home heating; one out of every four homes is estimated to be heated by a power burner or a space heater.

Large amounts of heavy oil are used in shipping, in industry, particularly in primary industries such as pulp and paper and metallurgical developments and by Canadian railroads for locomotives. Canada depends, therefore, on large volumes of oil, not only for the fundamental energy requirements of the economy but also for providing the substantial amounts of gasoline and heating oil required to meet the needs of a constantly rising standard of living.

In 1946, exploration for petroleum required the use of only 19 drilling rigs in Western Canada; now, there are about 275. In 1946, 11 geophysical crews were operating as against approximately 165 now. In 1946, Western Canada's estimated reserves of crude were approximately 45 million


ALBERTA
1947
1948
1949
1950
1951
1952
PRODUCTION IN BARRELS (CRUDE OIL)
6,382,059
10,504,928
19,768,946
27,149,232
45,915,384
24,863,830 (1st 6 Months)
AVERAGE DAILY RATE OF PRODUCTION DECEMBER & JUNE
ACTUAL & POSSIBLE
20,300B/D
36,000B/D
52,900B/D
150,000B/D
78,700B/D
195,000B/D
122,400B/D
245,000B/D
174,333 (actual)
(During June)
PRODUCING WELLS
CRUDE OIL
AT DEC. 31
606
717
1,219
1,995
2,738
2852
(June)
FOOTAGE DRILLED
882,358
1,663,687
3,212,616
4,330,198
5,562,665
3,174,026 (1st 6 Months)
RESERVATIONS AT DEC. 31
(ACRES)
11,472,501
114
23,473,490
295
36,999,816
506
37,123,411
502
48,261,209
699
742
44,537,716
(Aug. 31)
PETROLEUM, NATURAL GAS LEASES AT DEC. 31
(ACRES)
907,624
2,458
2,556,083
4,606
3,395,692
6,500
5,769,336
9,351
9,113,083
14,329
12,158,268
18,189
(Aug. 31)
MONEY SPENT IN EXPLORATION & DEVELOPMENT
25,000,000
50,000,000
100,000,000
150,000,000
200,000,000
Not Available
LEASE SALES
RENTAL & ROYALTY
REVENUE TO PROVINCE
IN DOLLARS
1,329,740
6,539,988
19,762,566
8,294,707
28,057,273
36,260,288
13,437,042
49,697,330
15,078,568
24,406,699
39,485,267
$15,929,185
$30,000,000 (Estimated)
(1st 6 Mos)

barrels; the reserves now are conservatively estimated at 1¾ billion barrels.

This is apart from the estimated reserves in the Fort McMurray bituminous oil sands, which are estimated at 100 to 300 billion barrels. In 1946, the daily Western Canada crude production was 20,000 barrels. At the present time, Western Canada's potential production is in excess of 265,000 barrels. In 1946, about 20 million acres of mineral rights were being actively explored. At this time, there are more than 168 million acres.

The timing is difficult to forecast, but it would seem quite possible that within the next five years the prairies will be capable of producing oil equal to Canada's requirements.

Until recently, the continental oil supply was based on two great internal producing areas, one in the Mid-Continent-Texas-Gulf of Mexico area, and the other in California. Supplies from these areas were supplemented by other states and by South America. Now, there is being formed a great triangle with one apex in the Texas-Gulf, one in California, and the third in Western Canada. In the interests of continental security, it is essential that these areas develop their potential oil production to the maximum so continental needs can be met as fully as possible from internal sources.

In doing this, the oil should be moved the shortest possible distance to market because unnecessary transportation is wasteful and penalizes the oil producer's incentive to discover the greatest amount of oil. It is not realistic to introduce unnatural obstacles to the free movement of energy from its source to its logical employment. The oil economy of the continent is allied with the security of the continent and, like that security, is indivisible.

With the development of oil resources on the prairies and with the promise of discoveries yet to come, the most important question facing the Canadian oil producers is that of markets. Oil is a commodity for which there is a universal demand and, like most similar commodities, its price is determined by the play of world competition. It follows that if Canadian crude is to find a market it must displace crudes which are now being obtained from other sources. To do this it must be made available at a competitive price.

For example, when Alberta crude oil sought a market in Ontario it had to displace crudes from the Mid-Continent fields in the U. S. The only way it was able to compete with this supply was with low cost transportation provided by the Interprovincial pipe line.

Similarly, the Trans Mountain pipe line is Alberta's competitive road to the Pacific Coast.

California for a long time has been one of the largest producers in the U. S., and is now producing about a million barrels per day. In the past, its crude production has kept pace with West Coast requirements.

Recently, however, these requirements have risen to such an extent that it has been necessary to bring oil from east of the Rocky Mountains. Because of the unpredictable nature of oil finding operations, it is difficult to forecast when or by how much California fields will fall short of supplying their customary markets. However, if and when the shortage increases, it would seem logical for the northwest states to look to the Canadian prairies for oil rather than to Texas, which is three times as far away.

During 1952, an average of approximately $750,000 will have been spent each day in the exploration and the production of crude and natural gas. In addition, tremendous sums are being spent in the building and expansion of pipe lines, the building of petroleum-chemical plants and expansion of refineries and marketing facilities.

By the end of 1952, the oil industry will have spent roughly $1 billion, or $70 per capita, in exploration and development in the Canadian west since 1947. For this sum, Canadian oil reserves have been multiplied 30 times. New refineries have been constructed, important price reductions have been made in the prairies' area affecting one-fifth of Canada's population, and a transportation system 2000 miles long carrying prairie oil to Ontario refineries has been put in operation.

Other important activities have been induced which are having a far-reaching effect, not only in the prairies but also throughout Canada. Now, another great step is being taken with the construction of the Trans Mountain pipe line.

During 1946-1951 about $1,190,000,000 was raised for oil development. The Canadian oil industry, from reinvested earnings and the sale of investments, supplied about $300 million, the investing public approximately $560 million, of which $350 million was through purchases of preferred stock, and $190 million through the purchase of common stock.

The oil industry of the U. S., through direct investments in Canada, contributed about $330 million.

What has already been done does not complete the program. To develop Canadian supplies to satisfy Canadian consumption, reserves must be increased by approximately another 2 billion barrels. Based on past experience, it is probable this will require an additional billion dollars in producing investment funds. The discovery and development of such reserves will, in turn, necessitate increased facilities for transportation, refining and marketing.

As of the latter part of October, there were approximately 260 rigs capable of drilling in Western Canada and the Territories. About 14 percent of these rigs still are not in operation due to the steel shortage. At the height of the steel shortage, it is estimated that about a third of Canada's rigs were shut down for lack of tubular goods.

Barring unforeseen events, it is possible that 1953 will see an increase in the production, number of producing wells during the year, the footage drilled, and the money spent in exploration and development.

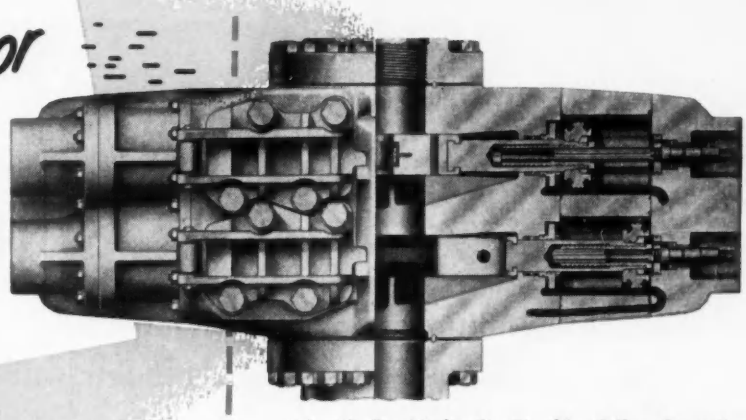
The action of the U. S. in reducing the tariff on Canadian crude is, of course, helpful, but it is possible that when computed by way of percentage costs of a barrel of crude, the reduction is not large enough to have any great impact on the export picture.

TABLE 1
Alberta Only

Footage Drilled First Six Months:			
1952:	3,174,026	(July, 1952:	611,208)
1951:	2,403,906	(Aug., 1952:	620,691)
Rigs Operating June 30:			
1952:	156		
1951:	148		
Crude Oil Wells Operating June 30:			
1952:	2,852		
1951:	2,122		
Crude Oil Wells Capable of Operation June 30:			
1952:	3,157		
1951:	2,349		
Crude Oil Wells Capable of Operation:			
Sept. 1, 1952:	3,331		
Sept. 3, 1951:	2,496		
Crude Oil Production First Six Months:			
1952:	24,863,830		
1951:	18,903,723		
Gas Production M.S.C.F. First Six Months:			
1952:	48,428,061		
1951:	43,155,329		
Crude Oil Sales First Six Months:			
1952:	$60,162,805.00		
1951:	$50,213,983.00		

In this gate *Simply Swing Open a Door to Change the Rams!*

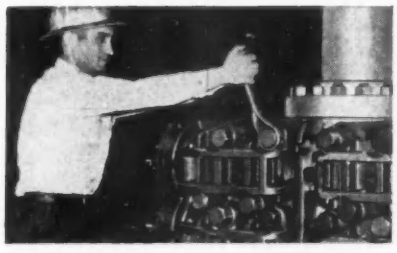
- whether pipe is in or out of the hole!



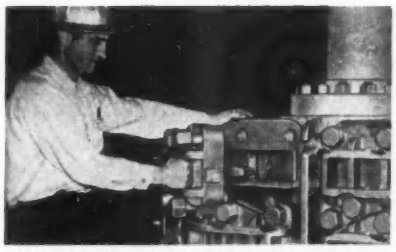
The Shaffer Hydraulic Double Cellar Control Gate (above) combines two separate ram compartments in ONE *body for maximum compactness. The Shaffer Hydraulic Single Cellar Control Gate is also available, if desired.*

SHAFFER HYDRAULIC CELLAR CONTROL GATES

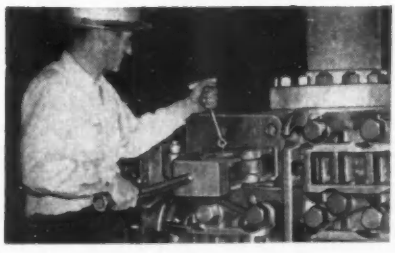
make ram changing as simple as this...



1. UNBOLT TWO DOORS in the side of the Gate by simply loosening four bolts in each door. The bolts remain in the doors where they won't be lost.



2. SWING THE DOORS OPEN and pull out the ram assembly. There is nothing to manually unlock and disengage—the complete ram assembly pulls right out.



3. LIFT THE RAMS from the Gate and replace the ram blocks and rubbers with others of the desired size—a quick and easy operation.

4. SLIDE THE RAM ASSEMBLY back into the Gate and bolt the doors. Guide ribs on the doors automatically align the ram assemblies as doors close.

AND NOTE THIS—*since the rams are changed from the side—not the end of the Gate, you can make a complete ram change with equal ease whether the pipe is in or out of the hole!*

Unequalled speed and simplicity in changing rams is only one of the many major advantages designed into Shaffer Hydraulic Cellar Control Gates. Other unique features are briefly outlined at right, but be sure to get the *complete* story on this Shaffer product before you buy *any* cellar control gate equipment. *No other equipment provides so much protection—in so small a space—with so many vital advantages!*

FOUR OTHER VITAL SHAFFER ADVANTAGES

Amazing Compactness—The Double Gate combines *two* separate ram compartments unitized into *one* body with an overall height of only 30" even in sizes as large as 13⅜" (12" Series 900). The Single Gate of like size, with one ram compartment, is considerably less in height than any other hydraulic gate on the market, measuring only 18½" high overall!

Fully Enclosed Design—with all moving parts, including piston rod ram shafts, completely enclosed within the body of the Gate. There are no outside moving parts to become wedged or damaged by objects falling into the cellar—or become corroded by chemical and salt drippings. Even the locking shaft is non-rising, fully protected!

Direct Hydraulic Drive—with the hydraulic operating cylinders *directly behind* each ram for maximum simplicity and safety. There are no complicated indirect connections between hydraulic cylinders and rams!

Quick Draining Body—with the rams traveling on high narrow guide ribs above the steeply-sloped bottoms of the ram compartments. Mud and sand quickly drain back into the well—no detrimental accumulations to interfere with free ram travel!

These and still other vital advantages combine to make the Shaffer Hydraulic Cellar Control Gate the most advanced hydraulic gate available today. Before you buy *any* control gate equipment, be sure to get the complete story from your nearby Shaffer representative—or write direct.

Write for your free copy of the new 1951 Shaffer Catalog. See Shaffer section—pages 4525 to 4600—of the 1951 Composite Catalog.

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CASPER, WYOMING, Shaffer Tool Works, Post Office Box 1788
EXPORT SALES OFFICE: Shaffer Tool Works, 500 Fifth Avenue, New York, N. Y., U.S.A.

How to Enter Oil Business in Canada

Conditions are largely similar to those in the U. S. New entrant should acquaint himself with regulations and the practices in his field. Here's a check list.

By DONN C. LANGFORD
Manager, Petroleum and Natural Gas Division, The Canadian Bank of Commerce, Calgary

THE RELATIONSHIP of Canada and and the U. S. is an example to the world of the good neighbor policy working at its best between two democratic countries.

This is readily understandable since the economic and political concepts of government, stemming from a common root, have much similarity. The mutuality of outlook and interests is further strengthened by an exchange of raw materials and manufactured products that is possibly not equalled in trade between any two other nations; great interchange of people as visitors and residents, and the investment of much capital in enterprises located in each other's country.

It is not surprising, therefore, that the many operators who came to Western Canada's sedimentary basin in recent years from the U. S. to search for oil and natural gas, or to supply the materials and services for that industry, found the general operating conditions there largely similar to those with which they were familiar in Texas, the Mid-Continent area, California and the other producing states.

The vast expansion of the petroleum industry in U. S. was taking place while Alberta's discoveries of oil and gas resources were comparatively small. Likewise, development of legislation and regulations affecting operating practices and conservation in the producing states preceded the establishment of legal organization in the various provinces of Canada.

The experience of the states was fully utilized in the drafting of provincial regulatory practices and bodies so that, when the potentialities of that great area were realized less than six years ago, the essential preparation had been done, principally in Alberta. This has been modified and enlarged in that province and similar provisions have been, or are being, made in other provinces as developments expand. The result is a general uniformity with the conditions that prevail in the U. S.

The new entrant to the Canadian picture immediately should acquaint himself with the regulations and practices that apply to his particular field of endeavor. Once a working knowledge of these is attained, it is the consensus that the opportunities of the country are equally favorable, if not more so.

Banking Connections. If you are a company or individual in the U. S. giving consideration to establishing in Canada, you will recognize that such a step is technically, at least, a foreign activity. As such, it differs from requirements of, say, opening a branch operation in North Dakota. No doubt you will consult with your tax authority in the U. S. as to the proper procedure to be followed in that country in order to obtain the maximum benefits from capital outlays, expenditures and possible profits to be made in the Canadian project.

The next step you will wish to take is to visit Western Canada and survey the country personally to see conditions under which you and your employes will operate. For supply companies, a marketing survey will be essential. The assistance of such organizations as the Western Canada Petroleum Association with headquarters in Calgary, Alberta, The Canadian Association of Oilwell Drilling Contractors, and other bodies will be found invaluable.

Most major operating companies of the U. S. have executive offices situated in Calgary, where also are located many independent producing companies with extensive experience in Canada. Canadian banks have been active in meeting the financial needs of the industry and aiding new entrants in becoming established. Discussions with bankers, operators, drilling contractors, and those engaged in the service and supply fields will prove useful in finding out how you can fit your business into the present development.

Several Canadian banks have branches or agencies in some of the principal cities of the U. S., and all have correspondent relations with the various leading banks of that country. Among the early arrangements you will wish to make in Canada is the establishment of a banking connection. At the same time, expert guidance on Canadian tax laws, etc., is necessary and this is usually obtained from a firm of chartered accountants (the Canadian equivalent of C. P. A.'s), some of which are branch offices of international organizations.

Others have affiliations with well known U. S. accounting firms. To comply with requirements of incorporating or registering a new organization and for advice on legal matters, the services of a Canadian lawyer are recommended. It is customary to establish the foregoing connections at the time the preliminary survey in Canada is undertaken.

One of the quickest ways to get into the exploratory and development activities is to engage a responsible petroleum consultant with lengthy experience in Canadian geology and operations. The services of a number of these experts are available and, by so utilizing such facilities, an entrant immediately has the added benefit of their knowledge of existing regulations. In the matter of supply of materials and equipment, most of the familiar trade names are at hand through Canadian agencies or branches of American manufacturers.

Foreign Exchange. Concerning the transfer of funds between the two countries, the author wishes to make it clear that the Canadian government a year ago, relinquished all foreign exchange control and discontinued the relative regulations. Financial transactions across the border are conducted in either U. S. or Canadian dollars purchased or sold on the free markets of both countries.

Rates of exchange fluctuate daily in the usual manner. At this writing, the Canadian dollar is quoted at approximately 3½ cents premium over the U. S. dollar. Canadian banks are well equipped to deal in exchange transactions of any size.

As a normal function, they also handle clean and documentary collections and all features of letter-of-credit business. Credit facilities are available and assistance by way of financing receivables and making production loans is widely used by the petroleum industry.

Income Taxation. A convention, signed by Canada and the U. S., is in effect for the avoidance of double taxation, both individual and corporate.

In Canada, income taxes are levied only by the Canadian government and not by cities, towns, municipalities or provincial governments, with the exception of Quebec Province where the effective corporate rate is 2 percent greater than in any other part of the country. With a few special exceptions, the current Canadian federal tax rates applicable to corporations are 22 percent on the first $10,000 of taxable income and 52 percent on such income in excess of $10,000.

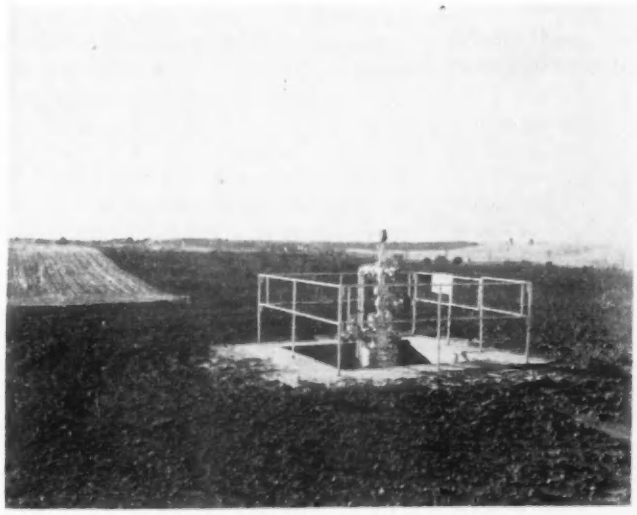
Present regulations are such that before an employer can bring in workmen from the states, he first must clear his request through agencies which establish that required personnel is not available in Canada.

If two or more corporations are related to each other as defined in the act, in a taxation year only one of them may take advantage of the 22 percent tax on the first $10,000 of taxable income. All rights for corporations to file consolidated tax returns have been withdrawn. Mandatory provisions are set up for the payment of corporate income taxes on a monthly instalment basis. Normal deductions are allowed for expenses incurred in the course of realizing income.

Depreciation Rates. Depreciation is allowed at rates applied on the net book value of any class of assets, i.e., the original cost less depreciation accumulated to date. Fifteen classes of assets have been defined. Here are a few:

- Six percent on most electrical generating equipment; pipe lines for oil, gas and water; manufacturing and distributing equipment and plant of a producer and distributor of gas.
- Five percent on buildings and other structures including many component parts (see also 10 percent rate).
- Ten percent on frame, log, stucco on frame, galvanized or corrugated iron buildings including many component parts; oil and water storage tanks and railway tank cars.
- Twenty percent on all depreciable assets not enumerated elsewhere with certain specific exceptions.
- Twenty-five percent on some electrical generating equipment; radio transmission and receiving equipment.
- Thirty percent on automobiles, airplanes, tractors, trailers, trucks and wagons; contractors' movable equipment (including portable camp buildings); gas and oil well equipment that is normally used above ground.

Provision is made for claiming an amount on property that is a leasehold interest, but oil and gas wells are excluded. Likewise, franchises, concessions and licenses relative to



Royalties on Alberta freehold acreage production average 12½ percent; on Crown lands, they range from 5 percent to 16⅔ percent, depending upon monthly yield. This is a typical flowing well completion in the Acheson area of Central Alberta.

In more developed areas, rights are largely held by lease, but elsewhere the government encourages exploration by granting reservations of not more than 100,000 acres each for a nominal fee and a deposit of $2500 for each 20,000 acres in the reservation. This shooter in a seismic party is lowering a shot in a geophysical survey hole.

property in respect of oil and gas wells do not qualify, with the exception of a franchise for distributing gas to consumers.

Casing must be written off to expense as used but any salvage must be included in income. A basic amount of drill pipe may be included in the cost of a drilling rig and depreciated accordingly with all additional purchases charged off to expense, or the stock of drill pipe may be inventoried annually so that all drill pipe is charged to expense when consumed and by this method no depreciation is involved. Tubing is a depreciable item at a rate of 30 percent.

Depletion Allowance. Depletion allowance in Canada is based on the net profits of the taxpayer. In the case of an operator of an oil or gas well, the deduction allowed is 33⅓ percent of the profits reasonably attributable to such production from the well. Where a person other than an operator has an interest in the proceeds or income, other than a dividend, the depletion allowed is 25 percent. These allowances continue indefinitely and bear no relation to the cost of acquiring properties, leases, etc.

On the other hand, expenses of acquisition of oil and natural gas leases including price, fees and legal expense in excess of depletion allowances, if any, at the time of abandonment are capital expenditures and may not be claimed for tax purposes.

Companies engaged in the petroleum industry are required to write off drilling and exploration expenses to the extent income is available, but if in excess of income, the expenses are capitalized for future use for this purpose.

Personal Income Tax. In the matter of personal income taxes, each single person is allowed an exemption of $1000 and a married couple $2000, provided the wife's income is nominal. An exemption for each dependent child under 19 is allowed in the bracket of $150 to $400 depending on certain circumstances (Figure 1). All children up to 16 years of age in Canada receive a grant from the Canadian Government ranging from $2 to $8 per month.

A short schedule showing the tax exigible for the year 1952 on various incomes is given in Table I.

The Canadian government does not claim any tax on bona fide capital gains whether made over a period of a day or a decade, nor is there any excess profits tax applicable to corporate earnings.

Customs Regulations. It would be impossible to deal even lightly with the ramifications of customs regulations in this review, but some indication might be given as to the attitude of the Canadian authorities toward the oil and gas industry. Much of the equipment and supplies commonly used are not manufactured or produced in Canada and are permitted free entry particularly under tariff item No. 848. These may be summarized as follows:

- All machinery and apparatus and parts thereof (including motive power) and drilling mud, for use exclusively in exploration or discovery work in connection with, and development, depletion and production of petroleum or natural gas wells; casing, tubing and drill pipe for use in connection with natural gas or oil wells.
- Geophysical surveying precision instruments and equipment for use exclusively in prospecting, provided they are of class or kind not made in Canada.
- The equipment mounted on cement and acidizing trucks, either new or used; separators; tanks up to 1000-barrel capacity to be located at well sites; lighting plants to be used for lighting the derrick; valves and pipe fittings for use on the Christmas tree; sundry tools such as bits but excluding hand tools; aircraft, aircraft parts and aircraft engines of types and sizes not made in Canada.

Some items subject to duties are classified below:

- Tanks other than those described above; tool-joint furnaces; power tools such as portable drills, etc., if of a type made in Canada; heater treaters; hand tools, valve and fittings other than those used on Christmas trees—22½ percent.
- Trucks including those on which rigs or other equipment are mounted but excluding such equipment; motor car pickups; passenger cars owned by a company (plus 25 percent excise tax)—17½ percent.
- Any casing or tubing used as flow or pipe lines other than in a well—up to 10½-inch inside diameter, 22½ percent; over 10½-inch inside diameter, 15½ percent.

All taxable items mentioned above are subject additionally to 10 percent sales tax.

Personal passenger cars may be imported (new or used) for a six-month period free of duty if a vehicle permit on Form E.50 is obtained. This permit may be renewed up to one year if sufficiently good reason is given. Personal luggage is permitted free entry.

A person intending to take up more or less permanent residence in Canada should obtain a landing certificate from the Department of Immigration which will entitle him to a "settler's effects" permit. This latter permit enables him to bring with him free of duty, all his personal belongings which he owned six months before coming to Canada. His automobile, however, is only duty free to a value of $1500. On any excess value, he is subject to the regular rates of 17½ percent duty, 10 percent sales tax and 25 percent excise tax.

Immigration. Canada welcomes U. S. citizens as visitors, tourists or immigrants and, subject to certain necessary requirements, tries to facilitate their entry as much as possible. No passport to enter Canada is required. Temporary visitors or tourists are not permitted to accept any employment while in Canada.

U. S. citizens who intend to enter Canada as settlers or intend to take up permanent residence must be in good health, of good character, and have sufficient funds to maintain themselves while located in employment or established in business or in any other enterprises of their own. Persons in this category should be prepared, when making application for entry at a Canadian port of entry at the international boundary, to supply verification of their assets and provide the examining immigration inspector with reasonable details as to their destination and their plans in regard to establishing themselves in Canada.

Persons intending to enter Canada on the above basis and requiring additional information are advised to write direct to the Immigration Branch—Department of Citizenship & Immigration at Ottawa, Canada, or at Dominion Public Building, Calgary, Alberta.

Intending employers in Canada must apply for approval for all U. S. personnel before such personnel arrives at the boundary. Such applications when effecting personnel for the oil industry should be endorsed by the Western Canada Petroleum Association, Calgary.

Before this association approves applications, particularly in regard to drilling personnel, evidence will be required that intending employers have made application to the National Employment Service and that it has been established that the re-

quired drilling personnel are not available in Canada. Personnel admitted under the above arrangement will be granted Form 242, Temporary Entry Permits, which will be subject to such extension as may be required, and as the circumstances warrant, upon application by the employers.

Persons entering Canada under this arrangement may not transfer from one employer to another while remaining in Canada. Extensions of Form 242 are limited to six months and should be applied for at the port of entry. Additional extensions may be obtained under present regulations.

A U. S. citizen in taking up residence in Canada is not required to become a Canadian citizen.

Leases, Reservations, Permits. Approximately 90 percent of Alberta's mineral rights in its 163 million acres are vested in the Provincial Government to which the term "Crown" is applied. In more developed areas, rights are largely held by lease but elsewhere the government encourages exploration by granting reservations of not more than 100,000 acres each for a nominal fee and a deposit in the amount of $2500 for each 20,000 acres contained in the reservation. Regulations govern the work to be done thereon and, if complied with, extensions up to three years—and in some cases 4½ years—may be obtained at a small cash rental charge.

Before the termination of a reservation, if kept in good standing, the holder may convert up to 50 percent of the lands to lease. On submission of a report, the deposit is returned and a credit of 50 percent of the approved expenditures may be granted to apply on the first year's lease rentals.

Certain Crown mineral rights are held in small parcels by the government and periodically some of these are put up for auction as a bonus for lease by sealed bid. It is thus possible for new entrants to obtain leases right in proven fields and achieve production income at an early stage after which a wildcat drilling program may be planned to round out the operation. Needless to say, the proven and semi-proven leases put up for auction command prices commensurate with their calculated potential.

As an incentive to explore for natural gas, the Alberta Government has special provisions for leasing areas at low rentals.

About the Author

DONN C. LANGFORD is manager of the Petroleum and Natural Gas Division of The Canadian Bank of Commerce at Calgary, Alberta. He was born in Saskatchewan and received his education in British Columbia and Ontario. Langford joined the bank 25 years ago in Toronto, where he occupied positions at branches and the head office, identified with commercial banking. He went to Calgary in 1949 and was instrumental in organizing the Petroleum and Natural Gas Division, designed to assist the Canadian petroleum industry.

Production Royalties. Royalties on production from freehold acreage are generally charged at 12½ percent. Royalties in respect of Crown leases are based on the monthly production for each well by means of a sliding scale as low as 5 percent for 600 barrels of oil or less and ranging up to 16⅔ percent for 4050 barrels or more.

Anyone interested in obtaining the regulations regarding the reservations or leasing of Provincial Rights in Alberta should write to the Department of Mines and Minerals at Edmonton.

In Saskatchewan and British Columbia, arrangements for obtaining exploration permits on Crown lands, somewhat similar to the provisions for reservations in Alberta, are in effect. Also, leases may be obtained from the respective Provincial Governments and the first-named province has commenced holding Crown reserve auctions.

Royalty on oil produced from Crown leases in Saskatchewan is also in accordance with a sliding-scale calculated on the monthly production from each well and within the bracket of 5 percent to 15 percent.

Conservation. Alberta and Saskatchewan have regulations to prevent waste of the resources and to govern drilling and production practices within the provinces.

In Alberta, the Conservation Board at Calgary establishes the MPR's of individual fields or wells. Periodically, these are amended in the light of engineering data. In cases where production is curtailed in the interests of effecting the maximum recovery from a pool, an economic rate is provided to ensure that the operator receives a "living wage" in relation to his development costs.

So each operator may be assured of his equitable share of the market, the anticipated demand is determined in advance from allocations submitted by crude purchasers, and this total is prorated each month in the form of daily allowables set for the fields.

The board has the authority to declare that operators of pipe lines are common carriers and that purchasers of oil and gas are common purchasers. The regulatory powers are broad but are fairly administered to the satisfaction of the industry.

Markets. With recoverable reserves of crude currently estimated at 1¾ billion barrels, almost entirely discovered in less than six years, Western Canada is actively developing new markets. A continued expansion in capacity of the pipe line to the Great Lakes is of great benefit to producers. But of major importance as a new and substantial outlet for the steadily growing potential is the construction of the Trans Mountain pipe line to Vancouver to be completed in 1953.

Reserves of natural gas might be estimated conservatively at 9 trillion cubic feet, but the real utilization of this resource awaits the building of large transmission lines. At that time, which appears to be not long distant, a new and valuable source of revenue will be realized.

Since exploration and drilling activity of Western Canada is showing steady growth from year to year and the number of new participants is continuing to rise confidence is given to the belief that Western Canada has something of merit to offer to the oil men from across the border in working and living conditions which have a definite appeal.

AREAS OF SEDIMENTS FAVORABLE FOR OIL PROSPECTING ... 15%
AREAS OF THIN SEDIMENTS ... 13%
AREAS OF MOUNTAINS AND IGNEOUS ROCKS ... 23%
PRECAMBRIAN SHIELD ... 49%
MILES
0
500

FIGURE 1.
Areas of sediments favorable for oil prospecting and areas of thin sediments.

How to Get Canadian Oil and Gas Leases

With four types of lands, the process is involved. Here's a simplified but detailed explanation of the problems.

By IVONE ST. G. BURN
Independent Land Consultant and Lease Broker, Calgary

SEDIMENTARY AREAS of Canada as shown on the map, (Figure 1) particularly these portions of the four Western Provinces and the North West Territories, are the areas of interest in the search for oil.

The term "mineral rights" applies here to petroleum and natural gas rights, and the various types of ownership of mineral rights encountered in the four Western Provinces are:

- Crown lands
- Hudson's Bay Company lands
- Canadian Pacific Railway Company lands
- Freehold lands

Originally, all surface and mineral rights belonged to the Crown. It is believed that at the time the British North America Act was passed in 1867 all lands in the four Western Provinces, except those of the Hudson's Bay Company, were owned as to surface and mineral rights by the Crown.

The Crown is represented in Canada, insofar as mineral rights are concerned, by the Dominion Government, Department of Mines and Resources, and by a similar department of each of the Provincial Governments.

In 1930 the Dominion Government transferred natural resources, including the petroleum and natural gas rights, of the Western Provinces to the respective Provincial Governments. This transfer, however, did not include Indian Reserves, National Parks, Soldiers' Settlement Board lands nor, now, Veterans' Land Act lands.

The lands in the Yukon and the North West Territories were also retained by the Dominion Government.

Hudson's Bay Company. In 1670 a prominent fur-trading company obtained a charter from King Charles II of England to trade in Canada and its lands were defined as all those watered by streams flowing into Hudson's Bay.

When "The Governor and Company of Adventurers of England Trading into Hudson's Bay" (better known today as "Hudson's Bay Company") ceded its rights and properties to Canada about 200 years later, it was allowed to retain its trading posts and certain lands in the three Prairie Provinces, then known as the "Fertile Belt."

These lands (Figure 2) were eventually resolved into all of Section 8 and the west half and southeast quarter of Section 26 in each township, except in townships divisible by five, where all of Section 26 was retained. This title included mineral and surface rights and applied to the lands in Alberta, Saskatchewan and Manitoba lying between the Canadian-U. S. boundary on the south and the North Saskatchewan River on the north. There have, of course, been some trades and exchanges since which vary the formula slightly in some places.

Hudson's Bay Company started reserving unto itself its mineral rights about 1910. This company owns the petroleum and natural gas rights under approximately 1,630,000 acres in Alberta; 2,350,000 acres in Saskatchewan; and 690,000 acres in Manitoba.

CPR Land. Canada needed railways to develop its natural resources and, as an inducement to build a railroad from Eastern Canada to the Pacific Ocean, the government in 1881 granted the Canadian Pacific Railway Company all the odd-numbered sections except 11 and 29 (which are usually known as School Lands (Figure 2) in each township within a distance of 25 miles of the railway.

There have been many exchanges which have varied this pattern, making solid blocks of CPR lands in certain areas, including those in the vicinity of Brooks, Bassano and Lethbridge, Alberta.

CPR sold both its surface and mineral rights in Alberta until about 1887, when it began reserving for itself coal; then in 1903, coal and valuable stone; and in 1905 coal, petroleum and valuable stone; and commencing in 1908, it reserved "all mines and minerals, including petroleum and natural gas."

These changes in title reservations are causing considerable difficulty now, for it is questionable whether

The surface owner under the 1905 reservation is also owner of the natural gas. A case has recently gone through the courts of Canada to the Privy Council in England in order to decide this point, but to date no decision has been published.

The Calgary & Edmonton Railway (commonly known as the "C & E"), acquired a similar but much smaller grant of land in portions of Alberta. The Canadian National Railway also has some lands in Saskatchewan.

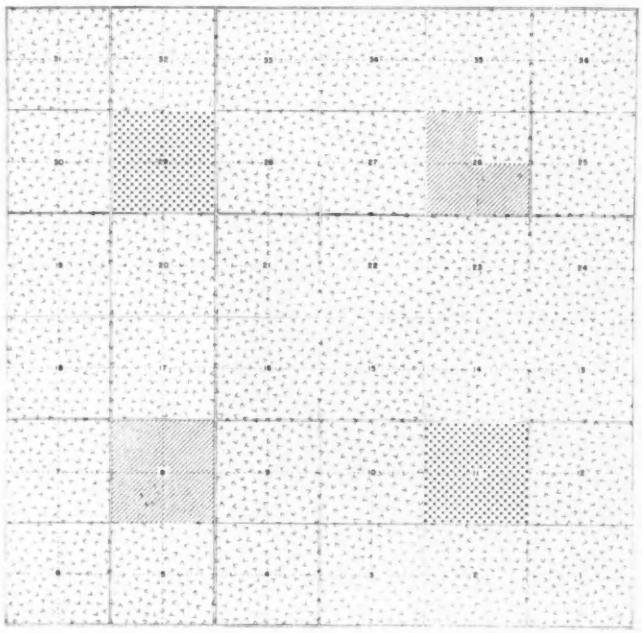


FIGURE 2.

This typical township plat shows lands in Sections 8 and 26 (shaded) which Hudson's Bay Company retained after ceding its rights and properties to Canada about 200 years after obtaining the original charter from King Charles II of England. The two other sections (dotted) are usually known as school lands.

Freehold Lands. Titles to petroleum and natural gas rights acquired by individuals from Hudson's Bay Company, the railway companies, and the Crown are usually referred to as "freehold."

Up to 1887 when a settler acquired from the Dominion Government a quarter-section of land by homesteading it, he became the owner of the petroleum and natural gas rights also. After that date, however, the government sold the surface but retained the petroleum and natural gas rights. Most of these original homesteaders have passed away, some having first sold their lands; others passing them on to heirs who, in turn, may have sold them. In some cases, the person selling has reserved the mineral title, thereby splitting the surface and mineral titles.

Alberta contains approximately 163.5 million acres and petroleum and natural gas rights owned by the province are estimated at 133 million acres. Petroleum and natural gas rights north of the north boundary of Township 60, except for a few scattered Indian reserves, belong to the province.

South of this line, it is estimated that 60 percent of the said rights belong to the province. The balance is made up of Indian Reserves (1,328,090 acres), national parks (approximately 13,434,240 acres) and lands of the Canadian Pacific Railway Company, the Hudson's Bay Company, the Calgary and Edmonton Corporation, Western Minerals, and various other land companies, and the freehold acreage owned by farmers and individuals.

In Saskatchewan the Crown Petroleum and natural gas rights are estimated to be 70 percent of the total, the balance being freehold, that is, owned by other than the Crown.

In Manitoba the Crown petroleum and natural gas rights approximate 60 percent with the freehold acreage at 40 percent. The larger percentage of freehold acreage in Manitoba is credited to the province's earlier settling.

In British Columbia, oil activity is almost all in the northeastern portion of the province, which is owned by the Provincial Government, except for Indian reserves and national parks. Near the coast and on Vancouver Island there are some freehold lands.

Acquisition of Mineral Rights. Ownership of petroleum and natural gas rights can be determined by searching in the Land Titles Office for the land registration district in which the land is situated.

Alberta and Saskatchewan use the Torrens System entirely, which enables the searcher to take the information from the latest certificate of title.

Manitoba has used the Torrens System since February 20, 1924, and to determine ownership of the mineral rights registered before that date a historical search must be made. British Columbia still uses the more complicated system which necessitates searching through from the patent to the present title.

After determining ownership, companies or individuals may acquire petroleum and natural gas rights from freehold owners or railways and other companies by such instruments as options, permits, reservations or leases.

Mineral rights underlying Provincial and Dominion Government lands are obtained by reservation or permit and lease on the terms set forth in the various government regulations.

Prior to the discovery of the Leduc field in Alberta in February, 1947, it

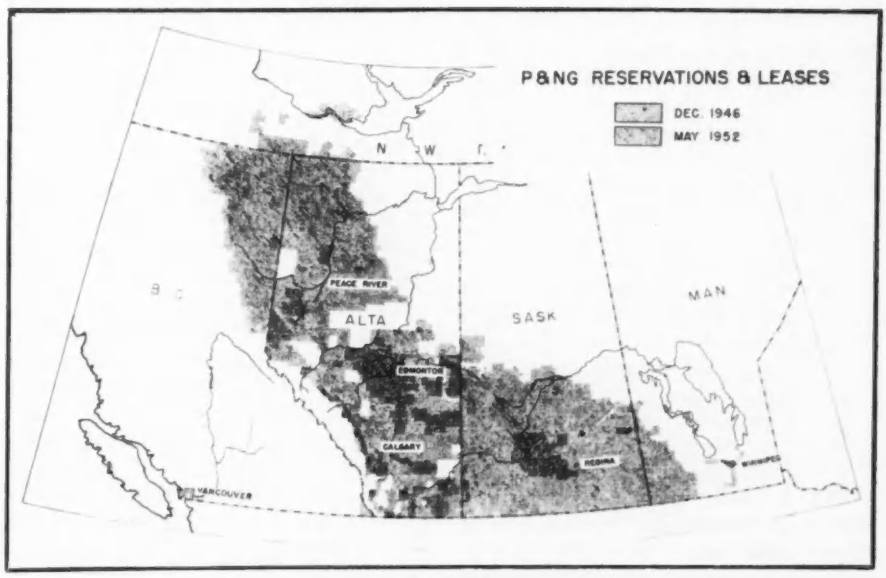


FIGURE 3.

Map shows, by dotted areas, those petroleum and natural gas reservations existing in December, 1946, and, for contrast, those leases existing as of May, 1952 (in hachures), emphasizing the wide increase in activity in the four western provinces during that period.

was relatively easy for landmen to lease large blocks of freehold petroleum and natural gas acreage at prices up to $1 per acre. Since, however, prices have increased and in "hot" areas run from $25 to several hundred dollars per acre.

A year or two ago in Saskatchewan and Manitoba freehold leases were purchased for as little as ten cents an acre. Many large areas were leased up by individuals and small companies at the low price and later sold to others at prices up to $5 per acre.

In Saskatchewan some leasing and mineral purchasing practices developed during this period that have made it necessary for the Saskatchewan Government to bring in regulations which might render some of the earlier leases invalid. Consequently, anyone acquiring Saskatchewan freehold leases from the lessor or the lessee should be sure they conform to the terms of these regulations. Officials of the Western Canada Petroleum Association in Calgary are presently reviewing new regulations recently drafted by the Province of Saskatchewan.

The complexity of the Crown petroleum and natural gas regulations in the various provinces makes it necessary for anyone proposing to acquire reservations or leases to make a careful study of the conditions in the province of interest before making the application.

In Alberta, where the greatest activity has occurred, regulations for obtaining reservations and leases of Crown petroleum and natural gas rights have been progressively changing. Reservations now are obtained by the regulations set forth in Order-in-Council No. 392-49 passed April 1, 1949, and as amended to date.

Alberta Reservations. The general terms of an Alberta Crown Reservation are:

1. It must be applied for at the Department of Mines and Minerals Office in Edmonton, Alberta.

2. The application must be accompanied by:
   (a) A fee of $250.
   (b) A deposit of $2500 for each 20,000 acres or portion thereof included in the reservation, the maximum deposit being $12,500. Deposit is refunded on termination of the reservation providing the regulations have been fully complied with.
   (c) A preliminary report indicating geological information already available on the area.

3. The maximum area of a reservation is 100,000 acres and the length must not exceed three times the breadth.

This is typical geophysical drilling rig operating in central Alberta area.

4. No applicant (individual or company) may hold more than two reservations in its or his name.

5. The original term is four months, renewable under certain conditions, for a maximum term of 4½ years.

6. The reservation may be extended without cost, other than exploration expenditures, for two four-month periods to complete the first year, provided proper progress reports are submitted to the government with each application for renewal.

7. The second year is made up of four three-month extensions. Each application for an extension requires a satisfactory progress report and costs for the first two periods of seven cents per acre and for the next two periods, eight cents per acre, making a total of 30 cents per acre for the year.

8. A well must be commenced, however, before the first third-year extension will be granted.

9. The third year is also made up of four three-month periods costing, in succession, 10, 15, 20 and 25 cents per acre, making a total of 70 cents per acre.

10. In the event of a deep-test drilling program, two additional three-month extensions may be obtained by the payment of 25 cents per acre for each extension.

All extensions, other than those making up the normal three-year term, must be approved by a board of arbitrators after it has been supplied with proper evidence at a special hearing.

11. Leases may be selected at any time during the life of a reservation, providing it is then in good standing.

12. Credit may be established amounting to one-half of the approved cost of geophysical exploration or drilling on the reservation and applied to pay the first year's rental on the leases selected from that reservation.

13. Leases may be taken only of one-half of the available Crown acreage contained in the reservation, with corresponding Crown reserve lands being set aside for each lease selected. Leases must be checkerboarded. The maximum lease comprises nine sections (three miles square) or eight sections (4 miles by 2 miles); a minimum lease comprises 160 acres. The length of a lease must not exceed twice the breadth. No leases can be taken from a reservation within a half mile of the boundary except by special arrangement.

Crown Leases. Crown leases may be selected from reservations or applied for directly if the lands desired are available.

1. The lease term is 21 years, renewable for further terms of 21 years so long as production is being taken from the lands.

2. The application fee is $10 and the annual rental $1 per acre.

3. Royalty on oil payable to the Crown is computed on a sliding scale of 5 percent to 16⅔ percent. The three simple examples for calculating the monthly Crown royalty are: monthly production of 0 to 600 barrels per well requires 5 percent of barrels produced; monthly production of 1500 to 1800 barrels per well requires 12½ percent of barrels produced; and monthly production of 4050 barrels and over per well requires 16⅔ percent of barrels produced.

The government accepts a cash royalty. Therefore, the computed number of barrels is multiplied by the field price and that amount is remitted to it.

Royalty on plant products such as fluid hydrocarbons and sulphur is 12½ percent and on natural gas is 15 percent, with a minimum of ¾ cents per thousand cubic feet.

4. The lease requires that drilling commence within one year from date of lease. Deferments may be obtained under Clause 250 (a) of the Mines and Minerals Act, and the usual time within which to offset a commercial producer is 90 days.

Natural Gas Licenses. Owing to the greatly increased interest in natural gas in Alberta, particularly for export to the West Coast and to Eastern Canada, new regulations were put into effect by Order-in-Council 122/51, January 29, 1951, providing

for natural gas licenses covering the natural gas zone of reservations then in effect, if applied for, and for later reservations on which a natural gas zone is discovered.

The fee is $250 and the rental five cents per acre for six months. Renewals of six months can be obtained at the same cost, with the maximum term of a license being three years. The license is kept in effect by drilling further wells for gas, with not more than three months elapsing between the completion of one well and commencement of another.

The area which can be leased from the licensed natural gas zone only is as follows:

- Six sections for each well finding gas in commercial quantities at not over 3000 feet.
- Eight sections for each well finding gas in commercial quantities at not over 6000 feet.
- Ten sections for each well finding gas in commercial quantities at over 6000 feet.

Natural Gas Leases. Natural gas leases have the same term and royalty rate as the petroleum and natural gas leases.

Rental is 10 cents per acre a year while there is no market available for the gas. With adequate markets becoming available the rental is to be prescribed by the Government. This could be 50 cents per acre, according to the indications in Clause 251 of the Mines and Minerals Act.

Institution of these regulations tended to accelerate the drilling of wells for natural gas in many areas.

Crown Auctions. One of the most interesting results of the Alberta leasing regulations is the sale of Crown Reserve acreage which, from the first sale in 1948 to Sept. 27, 1952, netted the Government $87,039,402.44 for 176,048 acres of leases, and $2,030,-173.44 for 840,294 acres contained in 13 reservations.

Sales are conducted from time to time by the sealed tender method and are held in the Department of Mines and Minerals offices at Edmonton. Leases are usually sold by the quarter section (160 acres).

Prices have varied greatly according to the location of the acreage, as the following "highs" for 160-acre parcels in some of the fields will indicate:

Leduc (southwest corner of field)	May 22, 1952	$ 551,100
Redwater	June 29, 1950	1,853,333
Woodbend	June 29, 1950	205,150
Camrose	May 22, 1952	360,000
Bonnie Glen	May 22, 1952	3,110,000

About the Author

IVONE ST. G. BURN was born at Lundbreck, Alberta, August 26, 1906, where he received his early school education. He attended high school at Vernon, British Columbia, and upon his graduation he was engaged in warehouse, ranching and electrical survey activities until 1928. He later attended the University of British Columbia at Vancouver. He was employed by Imperial Oil Limited and subsidiary companies in the electrical survey department and exploration department until October, 1940, when he became manager of the land department. In 1948 he became associated with Pacific Petroleums Ltd. as manager of that company's land department, a post he held until September 8, 1950, when he took the same title with Canadian Delhi Oil Ltd. In 1951, Burn was appointed vice president of Scurry Oils Limited, and on Nov. 1 he became an independent land consultant and lease broker, with headquarters at Calgary.

In one area, $1,501,606.33 was paid for a quarter section on which only a dry hole was drilled.

Increase in activity in the four Western Provinces and the North West Territories from December, 1946, to May, 1952, is clearly indicated in Figure 3.

Alberta Surface Rights. In Alberta, owing to the large percentage of Crown-owned petroleum and natural gas rights, entry on the surface of these lands for drilling and production operations is more of a problem than in other countries where the larger percentage of surface owners are also the owners of the petroleum and natural gas rights.

The first year's rental on three-to five-acre wellsites with roadways varies from $25 to $2000, depending on the value of the land for farming purposes, the area required and, sometimes, the proximity to the farmer's dwelling. The second and succeeding years' rentals usually vary from $5 to $100 per acre for each acre of the wellsite retained. There are some instances of the operators purchasing the wellsites and roadways required, or even the quarter section the wells are to be drilled on, at approximately the "going" price for land in the area.

Easements for pipe line rights-of-way vary from $25 to $125 per acre, plus, of course, payment for any crop or other damage.

The government has made provision for the oil operators to gain entry on any area on which they are entitled to do so (in the event mutually satisfactory arrangements cannot be made with the surface owner) through the Right of Entry Arbitration Board, in the case of wellsites, production batteries and connecting pipe line rights-of-way; and the Board of Public Utility Commissioners for pipe lines used to gather and transport oil and natural gas.

Other provinces face similar surface problems and have government bodies available when required to help the oil operator.

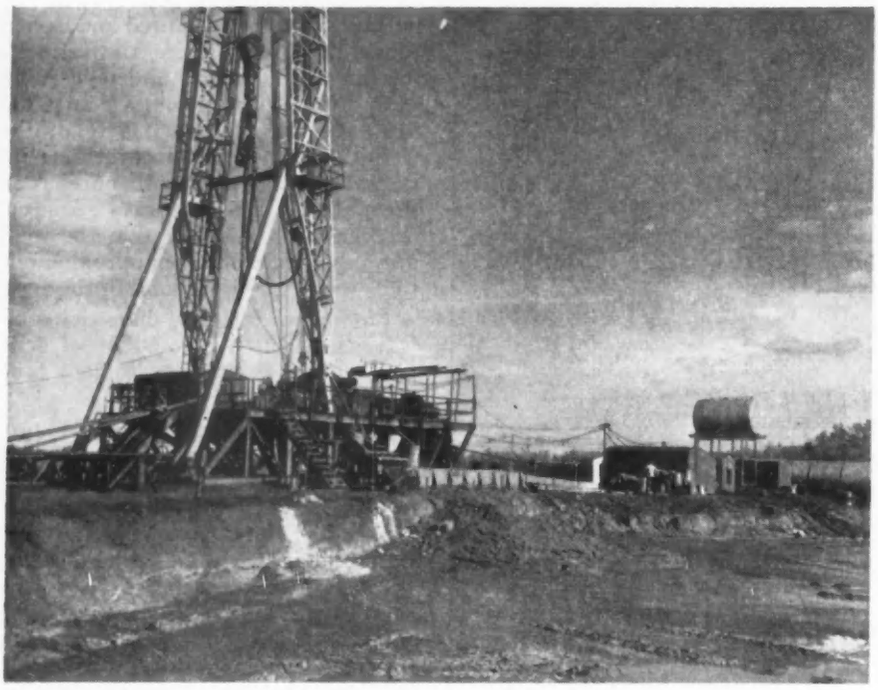
Future Activity. Basically, the term of the various Crown leases is long (usually 21 years), but rentals on large blocks of leases become burdensome and many leases will have to be farmed out or surrendered before even the first 21-year term has expired.

The various freehold and company leases (or reservations) vary greatly as to the conditions and number of years the lease is in effect. Previous to the Leduc discovery most leases were for a term of ten years, but since that time leases were usually taken for much shorter periods.

The result is that leasing opportunities, particularly of freehold lands, will tend to increase during the next few years as these lands become available for releasing. Consequently, it is the author's opinion that activity in the oil industry in Canada will continue to increase during the next few years because the present holders of extensive acreage will not be able to meet all of their commitments and will either have to surrender some of their holdings or obtain assistance by sub-leases or farm-outs to other companies and individuals anxious to participate in active exploration and development operations.

ACKNOWLEDGMENT

This paper presented originally at the Annual Western Meeting of the Canadian Institute of Mining and Metallurgy held Oct. 15-17, 1952, at Winnipeg, Manitoba.



This jackknife type drilling rig is operating in the Nevis field, major wet gas producing area about 16 miles west of Stettler field in central Alberta.

Nevis Field Growing

With proven wet gas reserves exceeding 400 billion cubic feet, a two-mile extension well may push area's limits even farther.

SINCE MARCH OF this year, the Nevis area, with only six wells drilled or drilling, has shown itself to be a wet gas reserve of major proportions.

The field, situated approximately 95 miles northwest of Calgary and about 16 miles west of Stettler, was discovered in March by Canadian Gulf Oil Company at its Lampert 4 in lsd 4-32-38-22W4, four miles southwest of Nevis. Already estimated to contain wet gas reserves in excess of 400 billion cubic feet, the field boasts a proven length of about six miles and a width of two miles and perhaps more if a Basal Quartz discovery in a two-mile extension test to the northwest should prove productive in the Devonian. Exact limits of the field still remain to be determined.

Wet gas, along with some naphtha, is found principally in the D2, but also has been found in the D3 in at least one well, and, depending upon structural position, at depths of from 5200 to 5700 feet. On the basis of development work so far, the structure extends in a northeast-southwest direction.

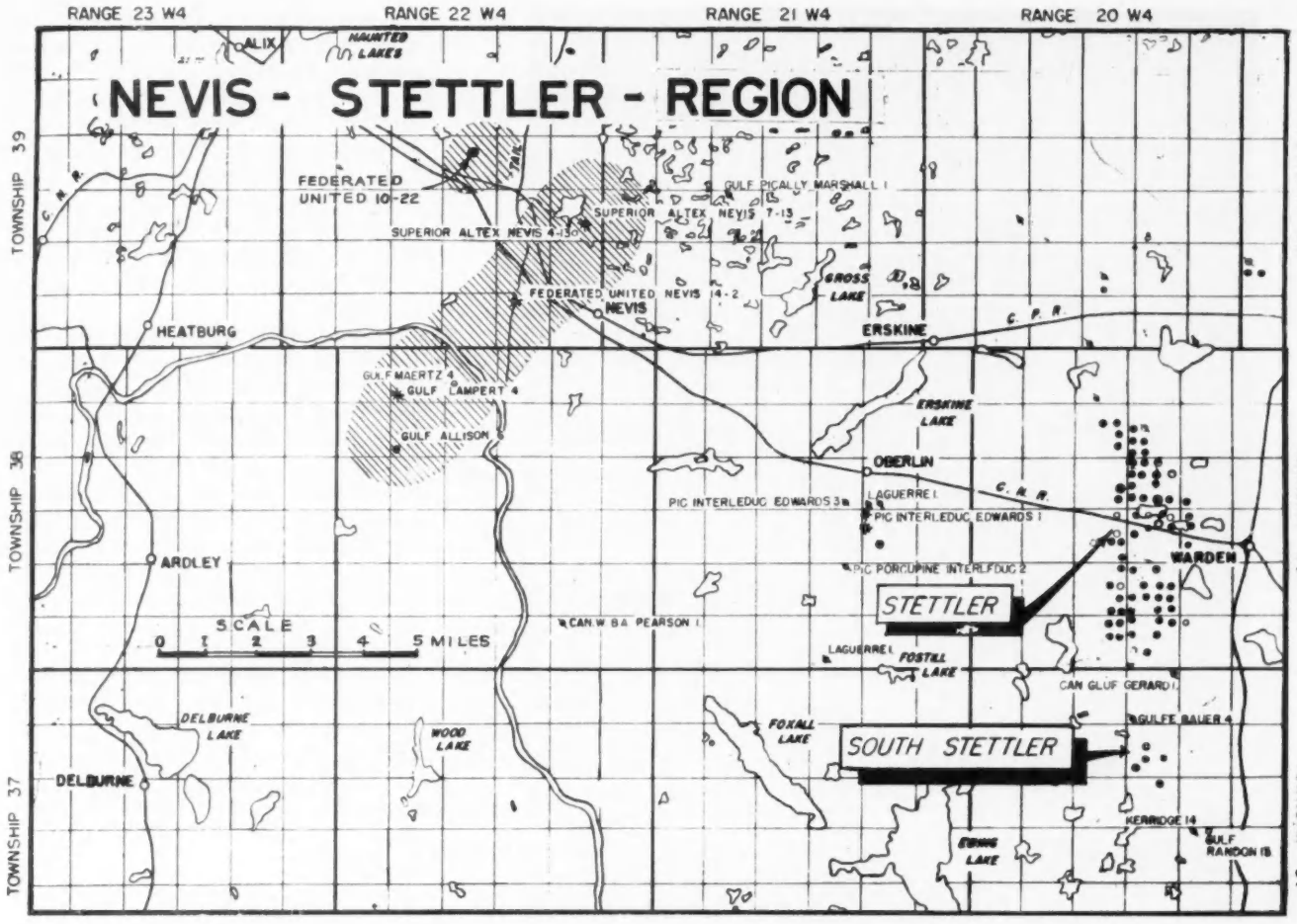
The most southwesterly well, Canadian Gulf's Allison 6, encountered a thin oil pay, approximately 10 feet thick, in the lower part of the D2 which, when tested, showed for about 960 barrels per day rate of 32.7 gravity crude through 13/64ths choke. One of the best of the wet gas wells, situated near the center of the area thus far developed, demonstrated a remarkable flow capacity of around 30 million cubic feet daily rate, along with traces of naphtha. It was estimated that the well had an open flow capacity of perhaps five times that figure.

Of further interest, at the moment, is the report that light gravity crude oil has been discovered in the Basal Quartz formation at a step-out test a little more than two miles northwest of the row of wet gas producers so far drilled. Through choke, on a 45-minute drill-stem test between 4477 and 4495 feet, the well demonstrated an 8 Mmcf. per day rate along with a spray of clean, 30-gravity crude oil. The operator, Federated Petroleum Limited-United Oils Limited, was coring ahead to further evaluate the new zone discovery.

If the Devonian also should be productive, it will represent a sizable enlargement of the known productive area of the Nevis field.

At present, two rigs are running,

Here is another drilling well in the Nevis area, which is shaping up as a 400-billion-cubic-foot field.

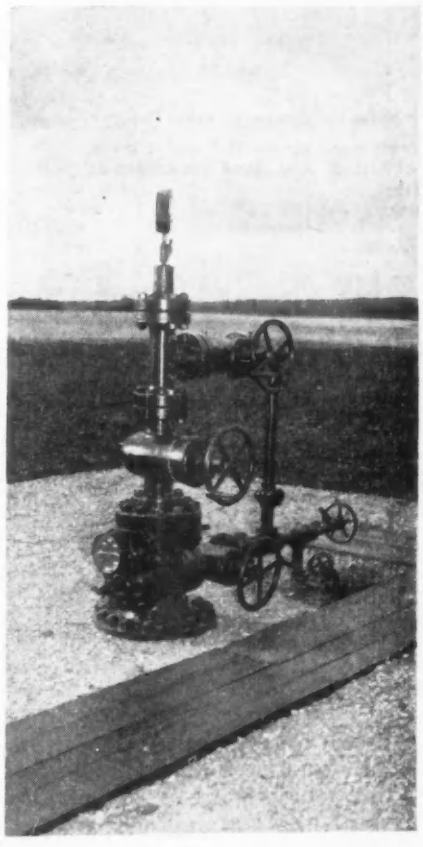


one each for Canadian Gulf and the team of Federated Petroleum Limited-United Oils Limited. Another operator in the field, with one well so far, is New Superior Oils of Canada Ltd. and Associates. Development work at present is not proceeding at a fast rate for, until a market is established for the gas and by-products to be extracted (naphtha, sulphur and various liquid hydrocarbons), most wells will remain shut in.

Drilling and Completion Data

Typical drill pipe program calls for four and one-half-inch down to about 5600 feet and three and one-half-inch if drilling goes beyond, for testing D3 zone, to depths of around 6700 feet. Three six-inch drill collars usually are used. Bit consumption outside of surface hole, includes about 36 of nine-inch and 14 of six and one-eighth-inch size.

Casing program usually is 10¾-inch surface string to around 600 feet and seven-inch oil string. Mud program usually calls for purchased starch type mud, and, at around 6100 feet in an interval where lost circulation sometimes is experienced, lost circulation materials are used. No cementing problems are encountered. Average rigging-up time, moving off to spudding in, is about 60 days.



This is one of the shut-in producing wells of Nevis field.

Rigs employed are of the jackknife type, powered by diesel engines. One mud pump usually is employed. Double blowout preventers are used. One shale shaker and excavated mud pits generally are hauled in from Alix, about eight miles northwest. Nearest supply center is Stettler, about 16 miles east.

Road conditions are generally good, with graded or gravelled roads off the main Lacombe-Stettler highway. Crews live in trailers or in nearby towns. Prevailing footage rates in the area range from about $5.50 to $6.50 per foot.

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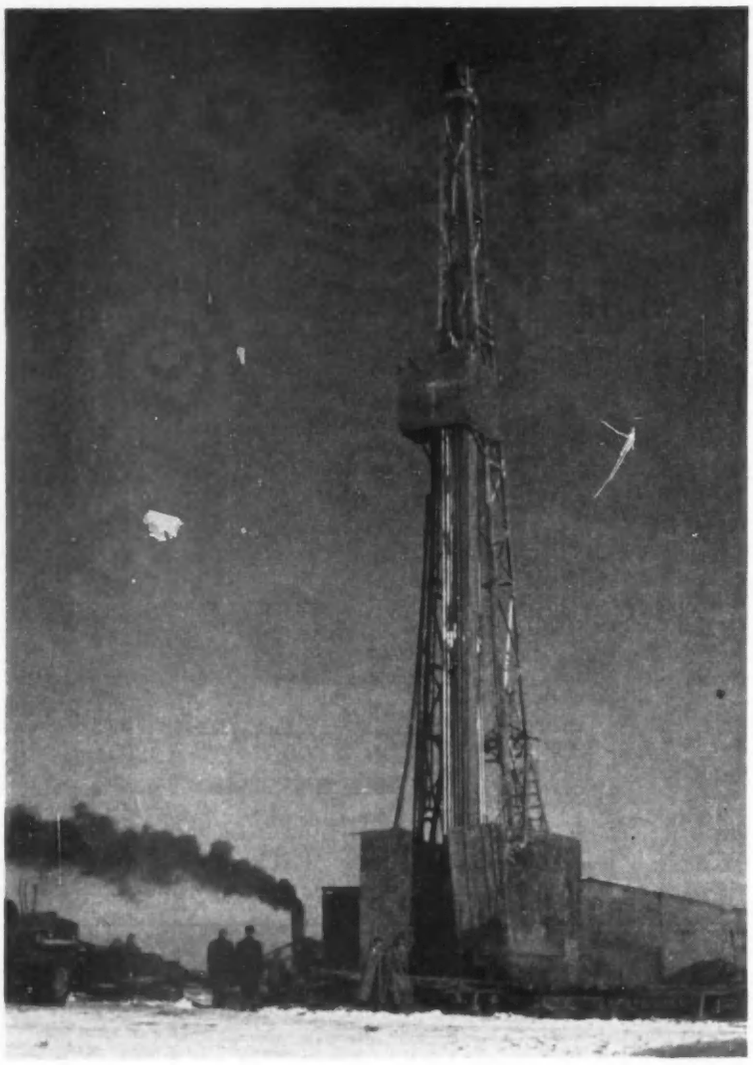

Photo Courtesy Saskatchewan Government Bureau of Publicity

This discovery well at Fosterton, Saskatchewan, found commercial production in a pay interval of between 30 and 40 feet of Roseray sand. Sand was topped at 3060-3100 feet.

New Discoveries Spur Saskatchewan Exploration

Off to a slow start three years ago, this prairie province now holds a prominent place in Western Canada petroleum picture.

By MAURICE KAMEN-KAYE
Exploration Consultant, Regina, Saskatchewan

INTENSIVE PETROLEUM EXPLORATION began in Saskatchewan about three years ago. At first there was little in the way of results to suggest that this prairie province between Alberta and Manitoba might become conspicuous in the picture of Western Canada's petroleum production. However, Saskatchewan prospects were brightening considerably toward the end of 1951. By early 1952 several discoveries of importance placed the province definitely on the road to development of potential fields.

Long established sources of production such as those from the Lloydminster-Lone Rock trend, although not spectacular, were showing definite increase. Discoveries such as Coleville at the end of 1951, and Fosterton early in 1952, not only added their quota of initial production but also gave promise of considerable additions after adjustment of marketing and transportation problems.

Total Saskatchewan production for the first seven months of 1952 was approximately 889,000 barrels, compared with 702,000 for the same period in 1951, an increase of 25 percent.

In the first week of 1952 banner headlines in the local press announced the first discovery of medium-grade oil in the province; in a wildcat well situated 25 miles west by north of Swift Current town.

A wildcat well, the first in a drilling block of about a million acres, had flowed 24-gravity oil on a drill-stem test. Small towns nearest the productive test clamored to have their names attached to the new discovery. It was first referred to as "Roseray," but after some discussion "Fosterton" was selected (Figure 1).

Prospects Bright

It was obvious from the first test that Fosterton was a discovery of at least commercial proportions. The pay horizon was a sand with an overall interval of 60 feet and a pay interval of between 30 and 40 feet. Despite low gas-oil ratio, the capacity for sustained flow suggested reserves of a satisfactory order, quite possibly 200,000 barrels per well.

Shallow depths at Fosterton were an added attraction to the operators. Thus the producing sand was topped at 3060-3100 feet. This producing sand was named the Roseray sand, perhaps the basal sand of the Blairmore group (Lower Cretaceous). If basal, there was the interesting possibility that the discovery was associated closely with the Jurassic-Cretaceous unconformity of Saskatchewan (See Figure 2.) A combination of paleography and structure might therefore have been important in the origin of this new field.

By October, 1952, 19 wells had been drilled in the Fosterton field. Of these, nine were apparent producers. The remaining ten were dry, partly through structural position and partly through rapid stratigraphic variation.

The field discovered at Fosterton proved to be more than an isolated accumulation of oil. Thus, early in

June, 1952, oil was produced on the pump from a Jurassic horizon at Midway, 17 miles southwest of Fosterton and 35 miles west by south of the town of Swift Current. A step-out one and one-half miles northwest of the pumper yielded gas at an open flow potential of seven million cubic feet per day, again from the Jurassic (Hulett calcareous member). Two further wells in the area were abandoned.

By July, 1952, another field had been discovered in the Fosterton region. This new discovery was at Cantuar, eight miles southeast of Fosterton, and 20 miles west of Swift Current. An initial discovery of medium gravity oil was reported as Lower Cretaceous, but late Jurassic sands may also be involved. By October, 1952, four producers had been drilled.

Oil was obtained at Success in mid-August, 1952. This was 22-gravity oil and, like the oil from some of the Fosterton wells, was recovered from the Lower Cretaceous Roseray sand. A stepout failed to produce in this area, located 12 miles east of Fosterton and 15 miles northwest of Swift Current.

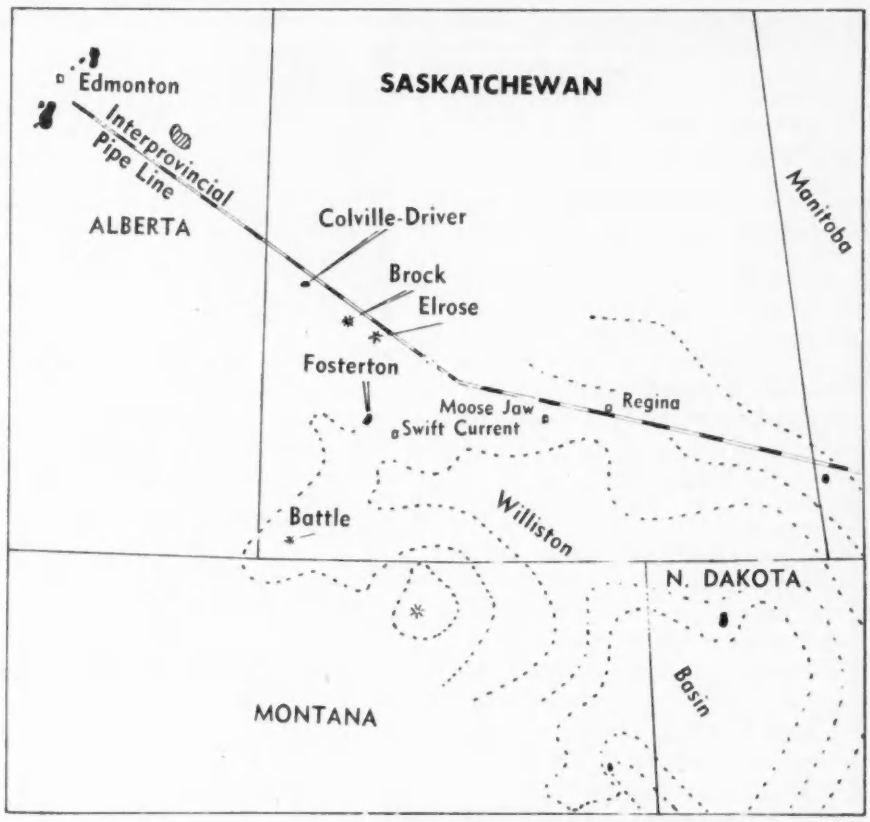

FIGURE 1. Index map.

Brock Area to Front

The Brock area attained prominence when Brock 2 came in as a second field gasser with an open-flow potential of 40 million cubic feet per day. In this case, the pay horizon was the celebrated Viking sand, known for many years as an oil and gas producer in Alberta.

By mid-May, 1952, six more wells had been added to the original two producers for a total of eight gas wells. Total daily potential of the eight wells was considered to be of the order of 70 million cubic feet. On this basis local pipe lines to the towns of Brock and Kindersley were begun in October, under a provincial government scheme to supply natural gas. The possibility of piping Brock natural gas to Saskatoon, 100 miles to the northeast, was under study.

The Viking sand provided additional news in April, 1952, when light oil flowed from the sand on a drill-stem test for the first time in Saskatchewan's exploration history. This new discovery was made in the Driver area west of the Coleville black-oil field. Once again the attractive feature of the find was its shallow depth. The sand was topped at about 2300 feet.

Elsewhere, oil staining of the Viking sand suggested that Driver might not be an exception; and that the new Viking-sand oil fields might follow Driver wherever the sand permeability was not retarded by cementation or shaling-up.

Although the Coleville oil field was discovered in 1951, much of its systematic development occurred in 1952. By August, 1952, 65 wells had been drilled to the Banff sand of presumed Mississippian age, Coleville's main reservoir horizon. Production from these 65 wells averages 700 to 900 barrels a day of 13.5 gravity asphaltic crude, all by pump. Two wells, however, are capable of free flow.

Geologic interest attaches to this

TABLE 1
Saskatchewan Stratigraphic Chart

Lithofacies	Detail	Thickness (Feet)	Formation Names in Use	Presumed Age
Clastic	Glacial debris	0– 800	"Drift"	Quarternary
Clastic	Gravel, sand	0– 200	Woodmountain	
Clastic	Gravel, sandstone, clay	0– 550	Cypress Hills	
Clastic	Sand, shale, coal	0– 400	Ravenscrag	Tertiary
Clastic	Mainly shale	500–4000	Colorado	Cretaceous
Clastic	Sand and shale	100– 500	Blairmore	
Varied	Shale, limestone evaporite	0– 500	Sundance, Gypsum Springs	Jurassic
Carbonate	Limestone (chert)	0–1500	Charles, Madison	Mississippian
Clastic	Dark shale and dolomitic sst.	0– 150	Kinderhook-Exshaw	
Clastic	Variegated shales, dolomite	75– 200	Three Forks-Potlatch	Devonian
Carbonate-Evaporite	Limestone-anhydrite	700–1800	Jefferson, etc.	
Carbonate-Clastic	Limestone-red shale	50– 250	1st—2nd Red Bed Interval	
Evaporite	Anhydrite halite and dolomite	0– 650	Biggar	
Carbonate	Dolomitic limestone and dolomite	0– 250	Winnipegosan	
Clastic	Red dolomitic shale	20– 50	Ashern	
Carbonate	Dolomitic limestone and dolomite	250– 1050	Stonewall, etc.	Siluro Ordivician
Clastic	Glauconitic sandstone, Variegated shales	0– 1650	Winnipeg	Cambro-Ordovician
Igneous	Granite	.....	Basement	Pre-Cambrian

field because the Mississippian horizons are close to truncation. Meteoric factors may therefore have influenced the reservoir horizon when the Coleville area lay at shallow depths under a landscape which was being actively eroded in the late Paleozoic times. Possibly such ancient meteoric factors may have contributed to chemical alteration of the oil and thus to its ultimate heaviness. In the last analysis, it may be found that some of the Coleville producing sands are infilling deposits of post-Mississippian age, laid down on a gently-undulating topography of Exshaw shales.

Viking Sand

Above the heavy-oil pay is the Viking sand with gas which, in the discovery well of the Coleville field, tested six million cubic feet a day, open flow potential.

The southwest corner of Saskatchewan came into the exploration news in mid-May, 1952, when a well near Battle yielded gas up to a daily total of 7 Mmcf. open-flow potential.

This discovery aroused interest because it confirmed earlier promise of the Jurassic as an objective not only in the southwest part of the province but elsewhere in a broad band along the international boundary.

Below the Jurassic, heavy oil was discovered in Mississippian limestone. This second discovery suggested the Battle structure was persistent in the Paleozoic and that new pays might be found as the well was deepened. Actually, when this well reached the Devonian, a flow of inert gas was obtained on a drill-stem test.

About the Author

MAURICE KAMEN-KAYE was for many years closely associated with exploration for oil in the plains of Central Venezuela, South America. He left Venezuela early in 1950 and has since been doing consulting work in the United States and Western Canada. During 1951 and 1952 the greater part of his work has been in Saskatchewan, where he is retained at present by Canadian Devonian Petroleums Ltd.

In mid-June, 1952, further proof that the Jurassic was oil-bearing was supplied by a discovery in this formation in the Eastend district, 40 miles northeast of Battle and 70 miles southwest of Swift Current. After plugging back, the limestone producing interval was cased off, perforated, acidized and swabbed. High production rates were obtained intermittently, but the true potential of the well was unreported as of October, 1952.

1952 Highlight

Perhaps the greatest interest of 1952 in Saskatchewan was centered in the oil showing which occurred during the drilling of a well at Ratcliffe, 100 miles south by east of Regina and only five miles north of the U. S. border. A drillstem test in the Mississippian yielded five feet of clear brown oil with a gravity reported as high as 35 degrees. Since Ratcliffe lies only 60 miles northwest of the prolific Mississippian fields of the Tioga-Beaver Lodge areas of North Dakota, the potentialities of this discovery have been regarded with high optimism.

The small recovery on drill-stem test has not deterred optimism because similar small initial recoveries in North Dakota were converted into important discoveries behind casing under controlled mechanical conditions.

As of fall, 1952, exploration of the prospective areas of Saskatchewan has resulted in several significant discoveries. Behind this achievement lies the large potential of knowledge gained in these developments; also in exploration of the yet unproductive areas. When this body of information is integrated and interpreted, a definite picture of Saskatchewan as an oil region begins to emerge. The technical aspects of this picture are treated as follows under the headings of stratigraphy, structure, paleogeography and exploration concepts.

Stratigraphy

Paleozoic stratigraphy in Saskatchewan is the expression of deposition on a slowly sinking shelf. Associated with this shelf were lands of low relief bordering a succession of Paleozoic strand lines. During long periods, the relief of these low-lying lands was reduced to such an extent that detritus ceased to be carried off shore.

At such times limestones, dolomitic limestones and calcareous dolomites formed a large percentage of the se-

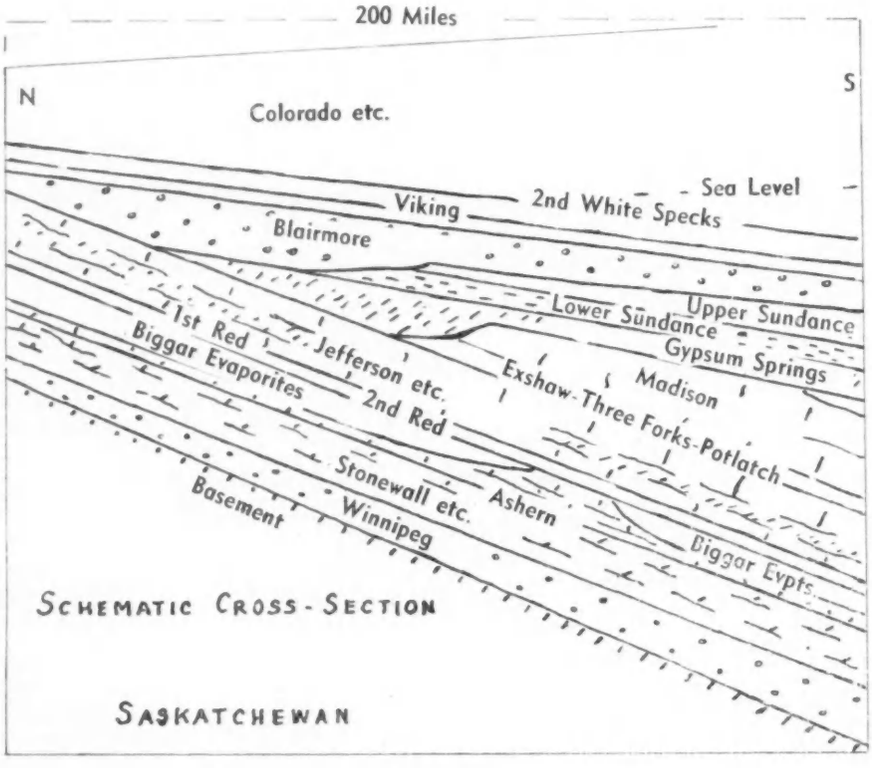

FIGURE 2
Saskatchewan schematic cross section.

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quence in Paleozoic seas. In addition, topographic and structural irregularities on the shallow floors of Paleozoic shelf seas gave rise to areas where marine waters were intermittently cut off and definitely restricted. Brine concentration took place in these restricted marine waters and dolomite, salt, anhydrite, and polyhalite were precipitated.

Barriers between restricted waters and the open seas must have been favorable sites for reefoid or coquinoid growth possibly not of biohermal character but at least of rubbly or autoclastic character suitable for porosity traps where petroleum could accumulate.

Conditions Varied

Intermittently, tendencies to emergence predominated. During such intervals, coastal plains of immense extent were alternately exposed and submerged. Mature rivers meandered across these coastal plains where presumably seasonal conditions provided an oxidizing environment in which red clays were formed on the mudflats.

Redistribution of these clays must have taken place when marine submergence occurred. In consequence, thin red-colored sheets were spread extensively across the Saskatchewan shelf and gave rise to the red shales which provide such excellent marker beds of the Paleozoic sequence on a regional scale. (Table 1.)

Acceleration in the rate of sinking of the Paleozoic shelf, and hence, deepening of the Paleozoic seaway across Saskatchewan, seems to have occurred only during deposition of the Exshaw shales. During this unique period, sources of sediments may have been pushed far back east into Manitoba so that lag deposits could develop slowly on the bottoms of the Exshaw seas.

In late Paleozoic times (post-Mississippian), there was extensive and possibly complete withdrawal of marine waters from Saskatchewan.

Mesozoic

Triassic seas may have entered the southern fringes of Saskatchewan, but their transgression was not extensive geographically nor persistent in strength. An arm of the Triassic sea may also have entered a local trough on the north. But for the main part this northern trough was landlocked and its sediments were largely fluviatile.

FIGURE 3. Saskatchewan paleogeography.

After Triassic times, subsidence of the Saskatchewan shelf continued steadily throughout the remainder of the Mesozoic. Thus in Jurassic and Cretaceous times much fine detritus was carried into shallow seas from low-lying lands on the east. Occasionally, this balance was disturbed by uplift—as in Sundance and Blairmore times—when sheets and tongues of sands were deposited during coarser clastic episodes.

The isopachs in basal Paleozoic sediments below the main basin in Saskatchewan suggest greatly differing paleographic trends in passing from initial Winnipeg clastics to later Stonewall carboniates. Such differences of trend suggest epeirogeny of the shelf in the progress of early Paleozoic times.

Structural Setting

In fact, this early trend variation and associated epeirogeny may have provided a structural setting for the great Biggar basin in which the main Paleozoic evaporites were deposited. (Figure 3.)

Later, while the thick Jefferson group of the Devonian was deposited, relatively local structural differentiation may have controlled the formation of smaller evaporite basins.

During Mississippian deposition, there was relative structural stability, but during a long interval of Permo-Pennsylvanian time the shelf was intermittently uplifted on its northern flank. Consequently drainage was toward the south down the long dip slopes of Mississippian limestone the ends of which had been uptilted in the north.

Structural hingelines were developed in this northern region and subsequent drainage worked east-west along these hinges. Trenching of soft beds under the Mississippian limestone led to scarp formation in the latter and the resulting scarp migrated slowly southward until general subsidence of the shelf resumed its progress.

As shown in Figure 2, this scarp could have been relatively well preserved. In addition, subsidiary scarps in upper beds may have survived from earlier geomorphic episodes.

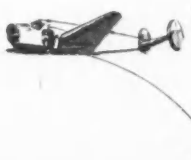
After gradual subsidence during Triassic times and strong marine transgression through a large part of Jurassic times, uplift again took place in the north. Once again the strata were uptilted at their northern ends and a gently undulating landscape with a modified northern scarp was sculptured in soft sediments before subsidence was resumed in Cretaceous times.

Post-Mesozoic

In latest Mesozoic times but more probably in early Cenozoic times, the periphery of the Saskatchewan shelf was uplifted. During these times of uplift and readjustment, the Williston basin took on much of the form which surface mapping and exploration drilling have now made familiar. This was a time of maximum mobility in a structural sense, possibly because of sediment overburden, possibly because of regional crustal instability as for example in the Rocky Mountain movements to the west, or possibly due to cyclical isostatic movement.

In any case, the effects were deep seated so that all horizons down to and including basement were molded to an approximate parallelism of structure. Nevertheless, response to this late-imposed movement was far from identical in detail. Plastic members such as salt and anhydrite undoubtedly responded to movement by greater deformation than the stiffer limestone and dolomites.

On the other hand, the deforming forces do not seem to have been of great strength so that diapiric and flow stages were not achieved, despite



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Exploration Concepts

The position of crystalline basement underlying the Williston Basin introduces an obvious north-south and northeast-southwest regional factor over the prospective exploration area of Saskatchewan (Figure 1).

In the sediments overlying basement thickening of the Paleozoic dolomite-limestone plate to the south should introduce a retarding effect on the regional gravity gradient (Figure 2). In fact, where thickening of the Paleozoic plate is sudden, for example, where Mississippian scarps develop, retardation of the regional gradient may be sufficiently marked to give "terrace" or "nosing" effects in the gravity contours. Knowing the approximate position of the Mississippian scarp, these effects should be selected and analyzed, using all available well control.

A similar retardation of the regional gradient should occur where the southern edge of the salt basin is reached. (Gradient retardation effects should be greatest where the Mississippian scarp and salt edge coincide.)

The outstanding velocity interface of Saskatchewan's prospective area is the interface between Mesozoic and Paleozoic sediments, that is, the surface of the Paleozoic. This surface should, in theory, be one of the best seismic markers available. In practice, however, the residual energy of reflections coming from horizons above the Paleozoic surface masks reflection energy coming from this surface.

Irregularities a Factor

Since the Paleozoic surface cannot be mapped seismically, the possible irregularities in its configuration must be visualized carefully when evaluating Paleozoic structures suggested by the seismograph. This is especially true where Mississippian scarping can be expected. In such cases, seismic results should be analyzed using trial-and-error approximations of Mississippian scarps whose dimensions are in keeping with known subsurface geology.

Away from the scarp areas it may be assumed that the Paleozoic surface is relatively gentle. Therefore, in structures of distinct relief, the seismic effect due to post-Cretaceous folding would outweigh the seismic effect of the Paleozoic surface. In these cases, there is close parallelism between the structure maps of deep and shallow seismic horizons.

Where seismic structures become low in relief and diffuse in pattern, effects of the Paleozoic surface increase in importance. In such cases there is a definite possibility that seismic structure shown on Paleozoic horizons may be in error.

Saskatchewan localities having excellent seismic structural relief have been tested to deep Paleozoic horizons without success. In nearly all cases only one well per seismic structure has been drilled.

The absence of true structure due to seismic "error" remains a possibility under these conditions. On the other hand, in the few cases where more than one well has been drilled the seismic structure appears to have been vindicated. There may, therefore, be factors other than lack of seismic resolving power associated with non-productivity of apparently good structures.

Source Beds Developed

Source beds seem adequately developed everywhere in the prospective area of Saskatchewan. They would, therefore, contribute equally to all types of structure and need not be considered as a factor associated with non-producing structures.

This leaves the possibility that post-Cretaceous folding may be the deciding factor. In other words, post-Cretaceous folding may have failed to exert a decisive influence over the emplacement of oil in some of the structures it raised. It may be that certain structures lay originally in graben-like areas which became zones of weakness at the time of post-Cretaceous movements. These zones of weakness may have reached high structural levels and may have brought up with them the waters of their former graben rather than oil.

By contrast, low-relief seismic structures may be areas which were already structurally formed before Cretaceous times, possibly by draping over older nuclei. These pre-existing structures may have resisted post-Cretaceous movements or may have been modified only slightly. Such low-relief structures (when not so low as to be near the tolerance limit of the seismic method) may prove to be favorable localities in Saskatchewan exploration.

Follows General Pattern

Saskatchewan follows the pattern of many subsiding shelf areas in having experienced a gradual peneplanation of basement and an encroachment of clastic cover.

In Saskatchewan, the cover of Winnipeg sands and associated shales was laid down in an easterly overlap pattern above basement. Under these conditions, lensing rather than sheeting was predominant and pinchouts may be expected in the Winnipeg sands. Trapping of oil should therefore take place where these pinchouts are uptilted either against structures or near them.

Above the Winnipeg clastics the regional dolomitic plate of Stonewell and Winnipegosan is relatively uniform in its paleogeography. However, an epeirogenic break, possibly of small vertical magnitude, must have intervened before the end of Winnipegosan times.

Tensional faulting may have contributed to this epeirogenic break and may even have been its principal agent. In any case, barriers were erected against the open Winnipegosan sea and restriction of saline waters took place in the regional Biggar Evaporite Basin (Figure 3).

Few Details Available

Although the edges of the Biggar Basin are broadly defined by existing exploratory tests, little paleogeographic detail is yet available. More test wells are necessary to investigate the possible existence of reefs, backreefs, pseudo-backreefs, or fragmental and conquinoid zones associated with edges of the evaporite facies.

However, since it is difficult to drill major exploratory wells on a purely paleogeographic basis, any broad exploration program should include a definite percentage of local seismograph structures occurring near the supposed evaporite edge.

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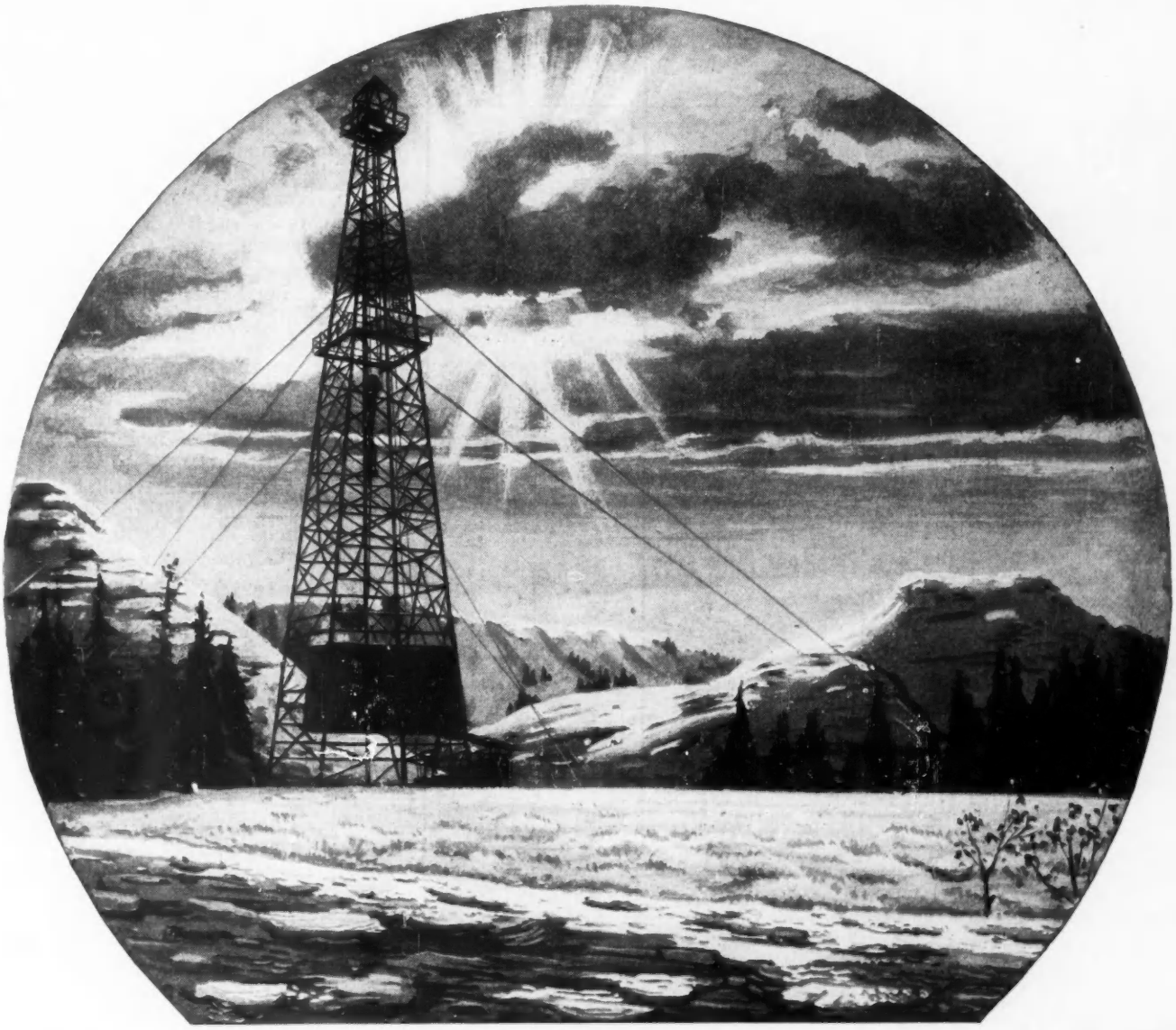

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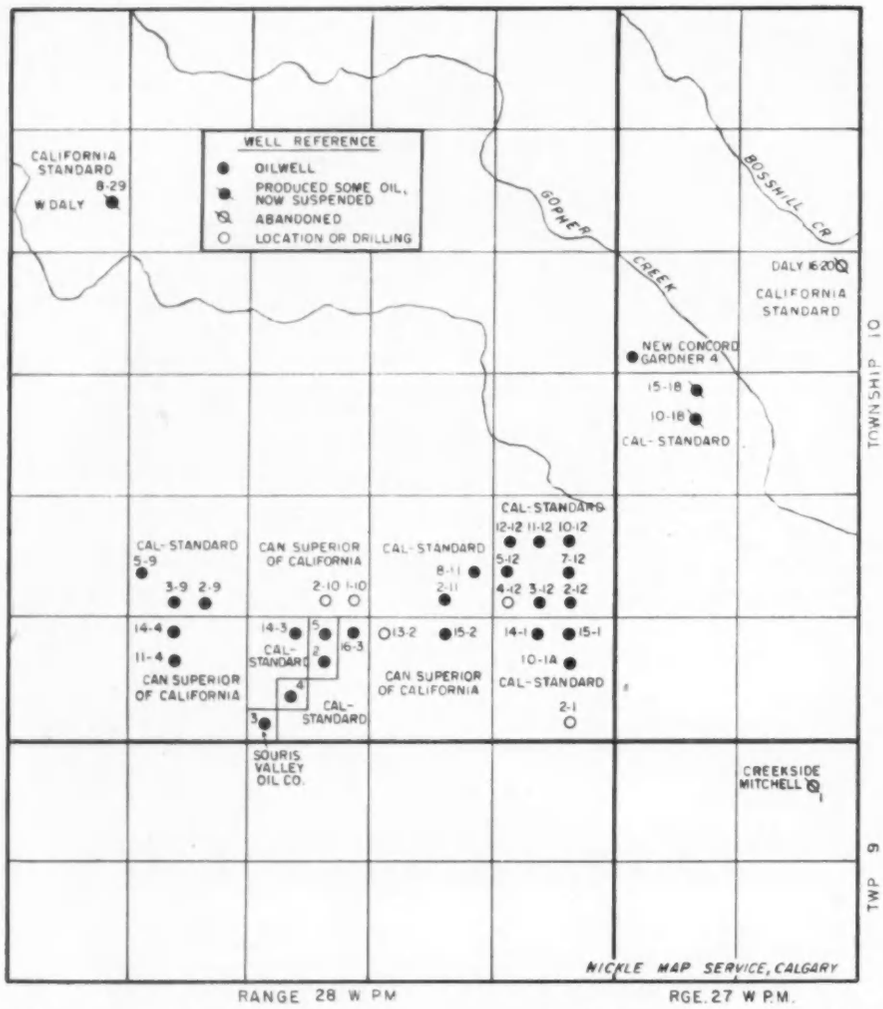

Producing wells and new locations in Daly area near Virden, Manitoba, at close of October, 1952.

Production Going Up In Southwest Manitoba

- **Exploration and development at peak.**
- **Three pools discovered.**
- **Numerous extensions made to Daly pool at Virden.**

By LARRY F. FRANTZ, Co-editor
Daily Oil Bulletin, Calgary

EXPLORATORY and development operations in southwest Manitoba are at the highest level the province ever has recorded. During 1952 alone, through the latter part of October, three small Madison limestone pools have been discovered and numerous extensions have been made to the Daly pool at Virden. The Virden strike was made in January, 1951, by The California Standard Company.

Crude production from southwestern Manitoba is expected to climb to around 1000 barrels daily during late 1952, nearly double its current output and more than 1000 percent greater than production during the first half of the current year. Manitoba recorded its first oil production in February of last year; averaged 32 barrels daily for 1951; 74 barrels daily during the first half of 1952; and, during September of this year, was yielding between 500 and 600 barrels daily.

The approaching production increase, which will be near actual potential for the province, coincides with completion of facilities for delivery of Manitoba oil to the Interprovincial Pipe Line. Manitoba crude commenced flowing through the Interprovincial Pipe Line in the latter part of October, marking the first time that crude other than that produced in Alberta fields was transported through that system. The Manitoba crude enters the pipe line at Interprovincial Pipe Line Company's Cromer, Manitoba, pump station, where two 5000-barrel storage tanks recently were installed.

The crude is delivered from the Virden field to Cromer tank farm by truck, enters the line at Cromer, flows to Gretna, Manitoba, and is then transported to Winnipeg by the Winnipeg Pipe Line, which joins the Interprovincial at Gretna.

The Virden oil pool is about eight miles northeast of the Cromer pump station, and truck deliveries from there are being made daily. Currently, the pipe line is pumping approximately 200 to 300 barrels of crude daily from the Manitoba oil area. California Standard Company officials have said the potential is about 700 barrels per day.

It is expected that the Tilston pool, 24 miles south of Cromer, and the Waskada pool, 46 miles to the southeast, also will ship crude to the pump station at a later date. Both of these oil strikes were discovered by California Standard this year.

Manitoba pools are situated in the northeast rim of the Williston Basin and all are productive in the Madison limestone. The Virden pool depth is about 2400 feet to 2500 feet, while Waskada and Tilston found their pay at around 3100 feet. The oil is a light crude, with gravity ranging from 32 to 35 degrees.

Manitoba's most recent oil find was made at a wildcat three miles north of the U. S. border and nine miles west-northwest of the Waskada discovery. This well, in the Coulter area, is owned by a Manitoba inde-

pendent company, Pascar Oils Limited.

The oil came from the Madison limestone, as in all previous discoveries in this area, during drill-stem test from 3201-11 feet. Recovery was 540 feet of 33 gravity crude. Production string of casing had been set, at last report, and it was anticipated that either an acid treatment or formation fracturing would be applied preliminary to running production tests.

Another recent extension to the Virden pool was made by Bailey Selburn Oil & Gas Limited, on a California Standard farmout, six miles north of Virden producers. At this writing, it is not as yet possible to determine full significance of this strike, which is situated in the Hargrave area, but swab tests, following acid treatment totalling 9000 gallons, gave up clean 34 gravity crude at a rate of five barrels per hour.

Of interest to operators in southwest Manitoba is the significant medium gravity discovery made in the southeast sector of Saskatchewan by the team of Imperial Oil Limited and the Tide Water group. This strike was made in the Lower Cretaceous at a venture in the Wapella area, 28 miles from the Manitoba border and 45 miles northwest of the Virden field. Latest swabbing tests at this discovery gave up 25 to 26 gravity oil at a rate of 100 barrels daily. Pay zone is around 2200 feet.

By the end of August, 16 wells had yielded a total of 33,647 barrels of oil from southwest Manitoba pools. Since then, several additional wells have been completed, including the Waskada discovery. With the exception of one month's output, 752 barrels, from the Tilston discovery well, all production as of August 31 had come from Virden pool wells. California Standard was owner of all the wells completed up to the end of August, except for three Virden oil wells drilled by Canadian Superior Oil Company of California Limited.

Operators in Manitoba currently have 12 rigs engaged in field development, step-out and wild-cat ventures. At least four geophysical parties are working in the field.

Although a major oil discovery has yet to be found in Manitoba, the encouraging small Madison oil pools have added incentive to the exploring companies which now are obtaining at least a moderate return for their efforts and exploration expenses.

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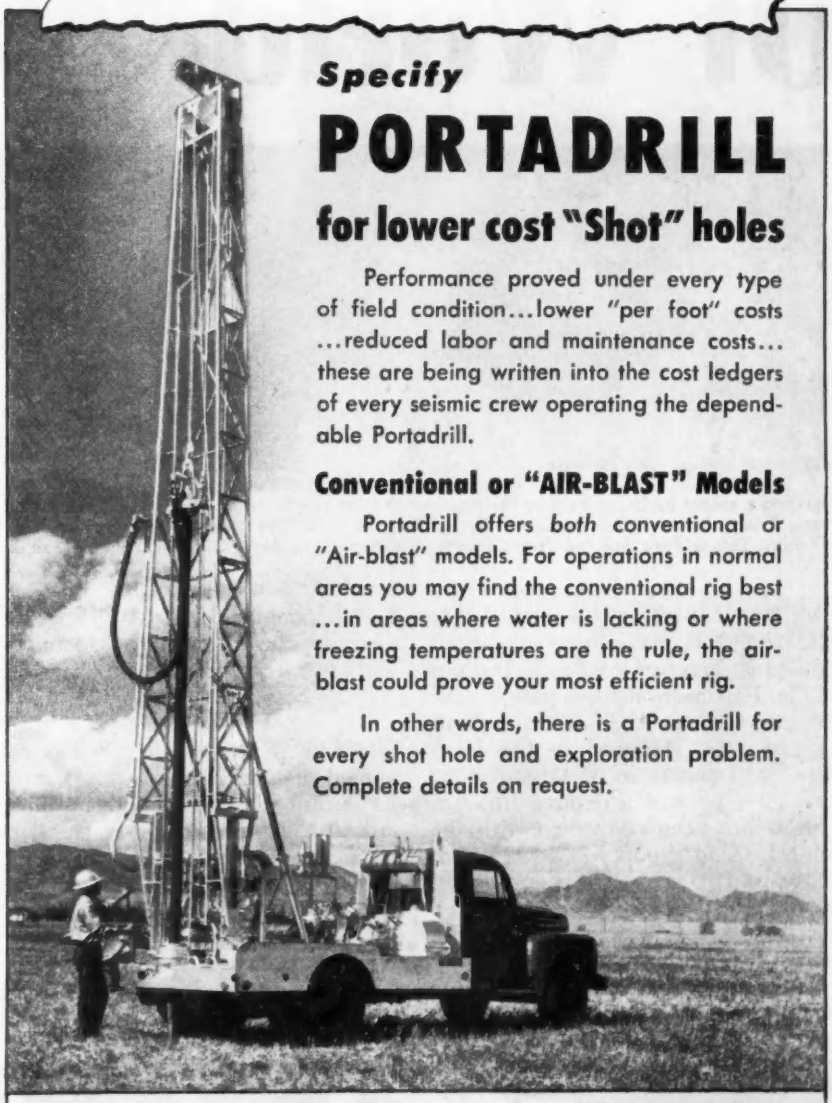

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Of World Oil Men

Attending a recent barbecue held by the Houston chapter of NOMADS were, left to right, Jack A. Barnes, Trinity Portland Cement Company, Houston; M. G. Erhard, International Petroleum Company, Talara, Peru, and Ing. Ivan Carvalho, Brazilian Government Oilfields, Bahia, Brazil.

J. M. PATTISON, C.B.E., and H. E. SNOW, C.B.E, have been appointed managing directors of Anglo-Iranian Oil Co. Pattinson, the company's general manager at Abadan throughout the last war, returned to the head office in London in 1945 and four years later became a deputy director.

Snow has been connected with the Anglo-Iranian group since 1921 and, for the past 16 years, has been a member of the company's distribution department, of which he became deputy director in 1946.

Their appointments follow the resignations of J. A. JAMESON, C.B.E., and F. G. C. MORRIS, who were appointed to the board in 1939 and 1946, respectively.

•

HIRAM R. MOORMAN has been named manager of Socony-Vacuum Exploration Company with headquarters at Calgary. Formerly chief geophysicist of the parent company, Socony-Vacuum Oil Company, with headquarters in New York, Moorman succeeds CLIFTON S. CORBETT, who has been transferred to the New York office as advisor to the coordinator of domestic production.

ERIC C. DRAKE, general manager of Anglo-Iranian Oil Company's operations in Iraq and Iran during last year's seizure of the company's properties in Iran, succeeded W. D. Heath Eves in New York as Anglo-Iranian's U. S. representative in New York effective December 1.

Eric C. Drake

Eves, who has resigned from the company, has headed the New York office since November, 1949, after having been deputy representative for 18 months.

Drake joined Anglo-Iranian in 1935 and served the company in various Middle Eastern countries for 14 years. He is an honor graduate of Cambridge University.

•

R. F. BRUCE TAYLOR of Toronto, has been elected treasurer of Trans Mountain Oil Pipe Line Company with offices in Vancouver, B. C. He succeeds J. M. TESCHER, San Francisco, who has resigned. Taylor is a graduate of Queens University and a former member of the firm of Edwards, Morgan and Company, chartered accountants, Toronto. During the war, he was in charge of the Toronto office of the Foreign Exchange Control Board.

R. F. B. Taylor

•

V. C. GEORGESCU, a Standard Oil Company (New Jersey) executive, who for ten years managed the operations of the company's affiliate in his native Roumania, has become an American citizen. His recent naturalization followed five years of residence in the U. S., to which he came shortly before Roumania nationalized its oil industry in 1948.

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Gas Export to East Causes Wide Speculation

A conference at Sarnia, Ontario, between Premier E. C. Manning of Alberta and Premier Leslie Frost of Ontario, has given rise to speculation that Alberta natural gas may be allowed to be exported to the eastern Canadian market in the near future.

An application last spring by Canadian Delhi Company, which proposed to build an all-Canadian gas line from southern Alberta to Montreal, Quebec, was rejected by the Alberta Petroleum and Natural Gas Conservation Board. It now is believed Delhi's proposal may be under reconsideration.

Premier Manning denied on his return to Edmonton that early export to the east is planned, stating that Alberta's stand on export is unchanged, and that his talks with Premier Frost were "informal chats."

But in Ontario, Premier Frost was quoted as saying he is anxious to get an Alberta-Ontario gas pipe line project started. A Toronto newspaper, the Globe and Mail, speculated that gas should be flowing into Ontario by 1956.

It was understood in Edmonton that Premier Manning had conferred with Clint Murchison, of Dallas, Texas, head of the Delhi Oil Co., which controls Canadian Delhi.

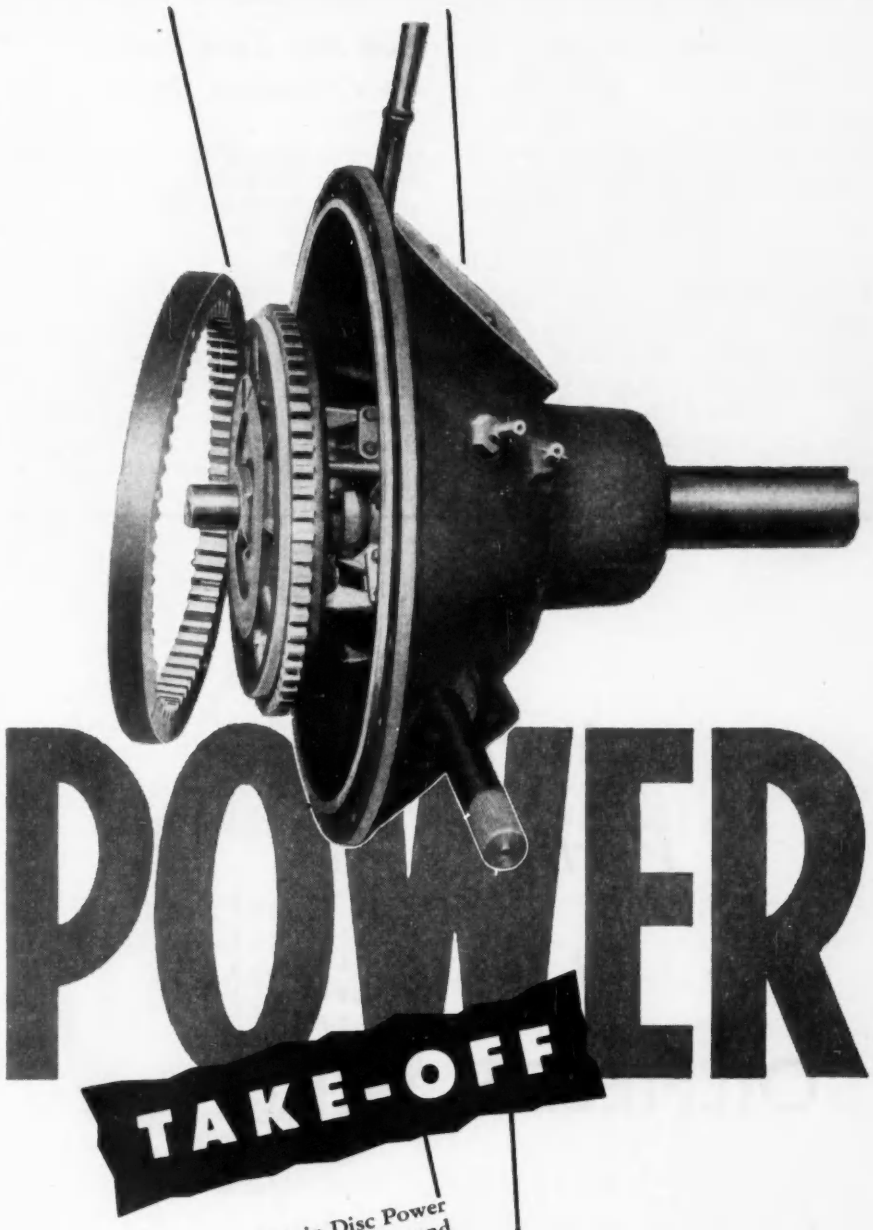
The Alberta-Montreal pipe line proposal was rejected by the Alberta conservation board last spring, at which time approval was given to Westcoast Transmission Company's plans to ship gas from the Peace River area in northwest Alberta and northeastern British Columbia to the Pacific Northwest area.

Alberta's policy is that gas export will be allowed, preferably over an all-Canadian line, providing the needs of Alberta consumers have been provided for first.

Alberta Crude Is Shipped To Refinery in B. C.

Crude from Alberta oil fields is being shipped by railroad to the West Coast market.

Rail shipments were inaugurated by Imperial Oil, Ltd., which is using the crude to supplement supplies from California. The crude, loaded at Niscu, loading point for the Leduc field, is going to the company's refinery at Ioco, near Vancouver—the first



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time prairie crude has reached a British Columbia refinery.

Imperial's first major shipment of 5400 barrels left Edmonton late in September in a 27-car train over the 810-mile Canadian National Railways route to the West Coast. Additional trainloads were planned and it is expected that for the next 12 months a little over 5000 barrels per day will move by rail to Vancouver.

Shipments are scheduled to continue until completion next year of the $83 million Trans Mountain oil pipe line from Edmonton to Vancouver.

New Pay Zone Found Near Cremona, Italy

A new pay zone has been discovered by Azienda Generale Italiana Petroli at Bordolano, near Cremona, at a depth of 6233 feet. Methane gas is being produced in a mixture of gasoline, and AGIP is considering erecting a degasolination plant at Bordolano.

In connection with oil and gas research and exploitation, Minister for Industry and Commerce Campilli has told the Parliament that AGIP, Ente Nazionale Metano and Montecatini Co. of Milan have been granted concessions covering 1119 square miles along the coastal belt of Abruzzi region. The concessions extend from Tortoreto to the Trigno River for a width of almost 100 miles.

The state, however, will not participate in research financing of the area, except that area under concession by AGIP, the capital of which is in the Italian treasury.

Minister Campilli also has said AGIP has begun studying construction of a gas line from the Po Valley to Central and Southern Italy in order to establish a connection between all existing gas fields.

Certain Italian industrial quarters call this clear confirmation of the government's intention of creating an exploitation monopoly over the entire peninsula—a monopoly that at present is limited to the Po Valley.

Before a decision is made on the north-south gas line, AGIP will have to decide whether the Po Valley gas structure would ensure a sufficiently large output to make the line economically feasible and whether any gas well horizons exist in Central and Southern Italy with which to supplement the Po's yield.

Ente Nazionale Metano, meanwhile, has announced discovery of a new gas structure in the Catania district of Sicily, where two wells have been completed for a total daily yield of about 5 Mmcf. Gas is produced from a depth of 5413 feet, and ENM geologists say additional structures may be found at a greater depth.

Anglo - Iranian Technicians Being Employed in Canada

Skilled technicians of Anglo-Iranian Oil Company who lost their jobs when the Iran oil crisis developed are finding work in Western Canada.

John Ferguson, director of the Alberta immigration bureau, said no accurate count of the number of Iranian oil workers coming to Canada has been kept, but the total is "considerable."

Most British technicians apply for work in Canada through Alberta House in London. Anglo-Iranian formerly employed about 3000 workers in its Iranian enterprise, and a spokesman for the company said in London that "a large number" of these have sought work in Canada.

The majority of British oil workers who come to Alberta find work in the geophysical exploration and petroleum engineering fields. Many have acquired responsible jobs with Canadian and American oil firms operating in Western Canada.

Hon. Dr. J. L. Robinson, minister

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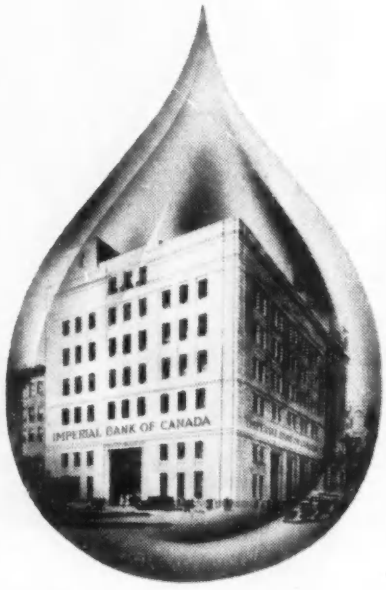

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of industries and labor for Alberta, said additional jobs are available for "displaced" Iranian oil men in the industries allied to oil.

Under construction two miles east of Edmonton is a $53 million chemical plant being built by Canadian Chemical Corporation. Dr. Robinson estimated that construction of the plant, largest industrial unit to come out of the Alberta oil boom, will require more than 2000 skilled workers.

Announcement that Trans-Mountain Oil Pipe Line company will build a line from Edmonton west to Vancouver, B.C., was seen as a blessing to British technicians seeking work in Canada. Their services will be needed on actual construction of the line, and at refineries expected to develop at the Canadian west coast as a result of Trans-Mountain's project.

Russian Group Takes Over Devoli Fields in Albania

An Albanian-Russian organization known as Albaruneftsyndikat has taken over the Devoli oil fields in Albania after the 1951 output in the fields declined 50 percent.

Albanian workers have been moved to Russia. Roumanian workers under Russian leaders have been moved in.

A 5500-barrel-a-day refinery is to be built at Valona with equipment being transferred from Novorossisk. The refinery will produce diesel and gas oil.

Russian military authorities approved the project after transportation of Albanian crude from Valona to Batum for refining proved too expensive.

Two wells drilled in the Miskolcz of Northeastern Hungary have disclosed an oil structure at 7000 feet. The Hungarian State Oil Department ordered four rigs moved into the Miskolcz district from the Balaton Lake area. Geologists estimated that oil could be obtained at more than 9000 feet.

Pakistan Quest Stepped Up By Deep Test in Patiya

East Pakistan's oil search was to be intensified with the spudding of a test in Patiya, Chittagong District.

The wildcat is to be drilled to 14,000 feet, if necessary, at a densely wooded location to which more than 6000 tons of material will be brought.

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ITALY: Azienda Generale Italiana Petroli has reported gas discovery at Bordolano, near Parma, at about 8000 feet, where an apparently rich deposit of liquid gas under high pressure was found . . . Dalmine Steel Works at Bergamo is financing Italian oil and gas exploration in the Pisa and Leghorn zones, with the assistance of Western Geophysical Company. Three wildcats have been started in the zones, but only methane gas, at 2460 feet, has been found.

POLAND: Poland recently bought new medium depth drilling rigs from the Soviet Union.

a WORLD of OIL

By DON KLIEWER
WORLD OIL Staff

RUSSIA: Instead of studying Russian drilling techniques, as Moscow originally claimed, it is now reported that the delegation of Hungarian oil men recently sent to Moscow, actually is briefing the Soviets on Hungarian producing and prospecting data. Among the oil men from Hungary are 52 of that nation's petroleum specialists.

MEXICO: Pemex, the government oil agency, has reported that a number of foreign company contracts has received Justice Department backing in answer to attacks against such contracts by leftist elements.

ITALIAN SOMALILAND: Amerada Petroleum Corporation, Continental Oil Company and The Ohio Oil Company have each acquired a one-sixth interest in the petroleum concession held by Sinclair Somal Corp., a subsidiary of Sinclair Oil Corp. Geological operations have already begun, and the company has opened an office in Mogadiscio.

ENGLAND: A seismic exploration party has begun work on an area around Screveton, seven miles south of D'Arcy Exploration Company's fields near Eakring, Nottinghamshire. This area was examined about two years ago by seismic refraction, which indicated the presence of an anticline. It is now being re-examined by seismic reflection to locate the culmination of the anticline to determine a possible exploratory well site.

VENEZUELA: Reflecting the reduction of 5.25 cents a barrel in the U. S. import tariff for crude below 25 gravity, Creole Petroleum Corp., has posted a five cents a barrel hike on several heavy crudes that became effective Oct. 11. The postings now are: Bachaquero crude, 14-14.9 gravity, $1.66; Tia Juana heavy, 19-19.9 gravity, $2.03; Lagunillas heavy, flat $2.05; Quiriquire, 18-18.9 gravity, $2.29; and Temblador, 20-20.9 gravity, $2.33 . . . This price change follows the pattern that the crude prices have been based on a parity with those in the U. S., with an allowance for the U. S. duty deducted.

AFGHANISTAN: The Soviets have protested the use of a few Americans in prospecting for oil along the Soviet border, it has been announced; however, the nation answered that oil prospecting in the northern province was in the country's best interests and harmed the interests of no neighboring country.

FRANCE: After years-long dependency on imports, practically all gasoline is supplied domestically.

CANADA: Imperial Oil Limited crude postings effective October 15 for 11 fields reflects increases in prices from two fields and drops in nine others: Redwater, $2.32½, up a cent; Excelsior, $2.26½, up a cent; Golden Spike, $2.38, down one cent; Acheson, Stony Plain and Armisie, $2.38, down a cent; Leduc-Calmar and Woodbend, $2.42½, down five cents; Joseph Lake, $2.32½, down a cent; Armena,

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$2.27½, down one cent; and Camrose, $2.23½, down a cent.

YEMEN: Several companies reportedly are bidding for permits to search for and develop oil resources in this arid Arabian kingdom.

PORTUGAL: The government has granted a three-year concession oil exploration concession to Companhia de Combustiveis do Lobito, says the Foreign Commerce Weekly. The concession is composed of the Congo district in northern Angola and the Guanza district of Cabinda enclave.

GERMANY: After a pipe line of about two and a half miles in length was laid to the rail station Klein-Kummerfeld, regular production of 247 barrels a day was begun by Boostedt 1, near Neumuenster (Middle Holstein). The joint interest group of Vacuum-Dea-Preussag will continue exploration in the area . . . A news agency report that a promising oil discovery was made at Wolfskehlen, near Darmstadt, was premature. Additional drilling will have to prove the commercial value of gas or oil deposits . . . The Mannesmann firm has begun building a six-inch pipe line from the Hemmelte oil field to the Bartmannsholte rail station, a distance of 37 miles . . . Gewerkschaft Strasserhof (Gerwekschaft Elwerath) and Deutsche Vacuum Oel AG have been granted concessions to prospect for and produce crude within the Land Bremen area . . . Scheerhorn 46, situated west of the Scheerhorn field, has struck oil . . . Deutsche Erdoel AG.'s Hohne 17 has found production of 56-70 barrels of oil daily in the Angulaten sandstone of the Liassic at a depth of 5759-5785 feet, resulting in the extension of the Hohne field producing area by about a mile in a northeasterly direction.

NETHERLANDS: Nederlandse Aardolie Maatschappij has abandoned a deep well near the Friesian village of Ried, in the vicinity of Franeker, after no traces of oil or gas were found at 9840 feet. The rig will be used to drill another well in southern Holland, near Loon op Zand, north of Tilburg.

HUNGARY: Twelve oil fields are now on production as compared with six before World War II, Budapest claims . . . While two seismographic units were in operation during 1951, imports from the Soviet Union have boosted the total number of mobile units to ten . . . The Soviet-Hungarian oil monopoly Maxzovol has announced that new, large shallow deposits of oil have been found in the vicinity of Mezoetur. Reports claim the discovery will approximate the Lispet field in size.

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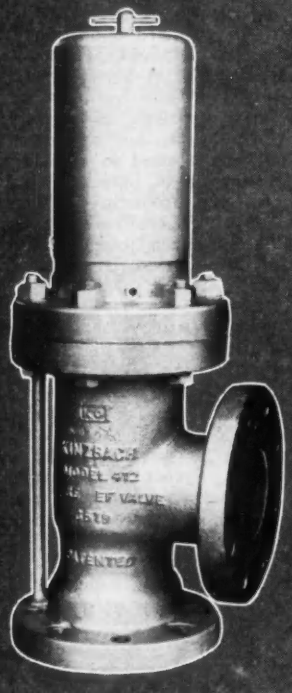

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News of Men in the Industry

Charles S. Mitchell was elected vice-president of Cities Service Oil Company (Del.) last month. Mitchell is a member of the board of directors of Cities Service Oil Company and president of Cities Service Pipe Line Company. He has been connected with Cities Service since 1930 when he joined the company as a junior engineer. Prior to his election as president of the pipe line company, he was manager of the Crude Oil Supply and Transportation division of Cities Service Oil Company, a position he still holds.

Charles Mitchell

•

H. S. Brigham was appointed manager of exploitation of the California area by Western Gulf Oil Company. Brigham has been with Western Gulf since 1943 when he joined the company as field superintendent of Oak Canyon operations. Prior to that he was associated with National Supply Company and Byron Jackson Company, acquiring experience in oil field supplies and service. In 1951 Gulf Oil Corporation sent him to South America on a special production assignment.

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Hollis D. Hedberg was named chief of the geology and geophysics section of the Land and Exploration branch by Gulf Oil Corporation. His headquarters are in Pittsburgh. He joined Gulf in 1928 as a stratigrapher and director of the geological laboratory in Maracaibo, Venezuela.

•

P. N. Colliston, proration engineer for Continental Oil Company, has been named chief proration engineer. A geological engineering graduate of the New Mexico School of Mines at Socorro, he has been associated with Conoco's proration activities since 1950.

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Dr. Ely Mencher, formerly senior field geologist and research geologist with the Socony Vacuum Oil Company of Venezuela, was recently appointed associate professor of geology in the Department of Geology and Geophysics at the Massachusetts Institute of Technology. At M.I.T. Dr. Mencher will conduct courses in stratigraphy and petroleum geology and will continue his research on the geology of South America.

•

H. W. Nippert has been named district petroleum engineer at Midland, Texas, by the West Texas division of The Texas Company. Nippert is a graduate of Texas Technological College, Lubbock, and joined the company as a roustabout in the Panhandle district in 1947. He has been district petroleum engineer at Pampa, Texas, since August, 1951.

R. G. Follis, chairman of the Standard Oil Company of California board, is now a director of The National City Bank of New York. Follis, who has been associated with Standard-California since his graduation from Princeton in 1924, became president of the company in 1945 and chairman of the board in January, 1950. He is also director and vice chairman of the board of Arabian American Oil Company, and chairman and director of Trans-Arabian Pipe Line Company.

R. G. Follis

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T. L. Lenzen was recently elected vice president of Standard Oil Company of California. He has been manager of Standard's Eastern Hemisphere operations and closely affiliated with Middle East oil developments since 1938. A director of Bahrein Petroleum Company, Ltd., California Texas Oil Company, Ltd., and Overseas Tankship Corporation, he has spent a great deal of time abroad as coordinator in the administration of Standard's interests in the affiliated producing and transportation companies operating in the Eastern Hemisphere. Lenzen joined Standard in 1928 after graduation from Stanford University.

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O. F. Sebesta has been promoted to general superintendent of drilling and production of the West Texas division of The Texas Company, Sebesta, a Texas A. & M. College graduate in petroleum engineering, started with Texaco as a roustabout at Houma, La., and advanced to petroleum engineer before taking leave for military service. Since rejoining Texaco in 1946 he has been drilling foreman at Penwell, Texas, and district superintendent at Midland, Texas.

•

H. J. Wharton, new chief exploitation engineer at Pittsburgh, joined Gulf Oil Corporation in 1928 as a petroleum engineer in Venezuela and in 1933 was transferred to the New York Foreign Production division as assistant to the general manager. In 1951 he was named technical advisor and served in that capacity until his recent promotion and transfer to Pittsburgh.

•

Thomas A. Matthews II has joined the chemical engineering department of The Western Company, Midland, Texas, and will engage in field service and research in connection with acidizing, perforating, and logging of wells. A graduate of Northwestern Technological Institute, Matthews spent six years in The Pure Oil Company's research and development laboratories at Crystal Lake, Ill. Active in the AIChE, Chicago section, he served as public relations chairman for the section, 1951-1952.

B. Brewster Jennings, president of Socony-Vacuum Oil Company, Inc., was presented with the Navy's Distinguished Public Service Award, the highest honor that may be conferred on a civilian. Jennings was associated with the successful supply of petroleum for the Allied Forces on a world-wide front while he served as deputy administrator for Tanker Operations, War Shipping Administration, during the first two years of World War II. **Dan A. Kimball,** secretary of the Navy, and **Robert A. Lovett,** secretary of Defense, presented the award.

B. B. Jennings

•

C. B. Wentz has been promoted to the newly created position of manager of Continental Oil Company's coordinating and planning department. He will continue to make his headquarters in Houston where he has served as chief proration engineer since 1950. Wentz joined Conoco at Ponca City, Okla., in 1938 after graduating from Lehigh University. He was associated with production activities the following year and in 1946 was named assistant proration engineer.

•

Wayne E. Glenn, Los Angeles, has been named assistant production manager of Continental Oil Company's Rocky Mountain region with headquarters at Denver. Glenn joined Conoco in 1943 as a petroleum engineer at Hobbs, N. M., and later worked at Ponca City, Okla., before being transferred to Los Angeles in 1944.

•

H. F. Longren has been named assistant district superintendent at Midland, Texas, for the Producing department of The Texas Company. Longren is a petroleum engineering graduate of the University of Texas and began work with Texaco as a roustabout at Monument, N. M. He was named petroleum engineer for the company in 1947, and since February, 1948, has been district petroleum engineer at Pampa, Texas.

•

J. G. Glenney was named district petroleum engineer at Pampa, Texas, having been transferred from Wichita Falls where he was serving as petroleum engineer for The Texas Company's Production department.

•

Kenneth E. Lundquist was recently promoted to engineer in the St. Louis Operating section of Standard Oil Company (Ohio). Lundquist joined Sohio as a junior engineer in 1951 upon graduation from Iowa State College with a degree in civil engineering. He had been on temporary assignment in Cleveland since January, 1952.

Walter S. Hallanan, chairman of the National Petroleum Council, has appointed a committee to make a study of the use of radio and radar in the oil and gas industries. **H. A. Stewart,** acting director of the Oil and Gas division of the department of the Interior, requested the committee be formed. Members of the committee are: **F. W. Littell,** Shell Pipe Line Corporation, Houston; **J. A. Polhemus, Jr.,** Standard Oil Company of California, San Francisco; **Joseph E. Keller,** attorney of Washington; **F. S. Bird,** The California Company, New Orleans; **Weldon Brigance,** Rowan Drilling Company, Fort Worth; **W. T. Bulla,** Natural Gas Pipeline Company of America, Chicago; **Robert Gray,** Ashland Oil and Refining Company, Ashland, Ky.; **Carl L. Lathrop,** Standard Oil Development Corporation, Linden, N. J.; **C. B. Lester,** Mid-Valley Pipe Line Company, Longview, Texas; **H. G. Pegues,** United Pipe Line Company, Shreveport, La.; **H. A. Rhodes,** Transcontinental Gas Pipe Line Corporation, Houston; **W. M. Rust, Jr.,** Humble Oil & Refining Company, Houston; **Chet F. Whaley,** Chet F. Whaley Well Servicing Company, Houston; and **R. D. Wyckoff,** Gulf Research & Development Company, Pittsburgh.

•

Jacques Ellison, Jr., was named senior district representative of the OIIC in New England to succeed **John B. Goodman.** Goodman is now in public relations work with The American Oil Company. Ellison has moved from Tulsa, where he was representative in the Kansas-Oklahoma district of OIIC, to Boston. A graduate of the University of Tulsa, Ellison had experience in publications work before joining the OIIC.

•

Stuart E. Buckley, Humble Oil and Refining Company, Houston, has been named one of six consultants to the Petroleum Administration for Defense to advise PAD in the investigation of the crude oil productive capacity of the U. S. **Minor S. Jameson,** Independent Petroleum Association of America, Washington; **Everett Trostel,** DeGolyer and MacNaughton, Dallas; **Earl Neal,** Standard Oil Company (N.J.), New York; **Edmund C. Babson,** Union Oil Company, Los Angeles; and **Paul Schultz,** Stanolind Oil and Gas Company, Tulsa, are the other members named.

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Charles F. Hunkins was appointed chief petroleum engineer, Oil Development department, of the Northern Pacific Railway Company. A petroleum engineering graduate of the University of California, he had previously been with British American Oil Producing Company as district superintendent at Bakersfield, Calif., and as production engineer for Tidewater Associated Oil Company.

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John K. Gill, independent oil operator, Okmulgee, Okla., elected president of the Okmulgee District Oil and Gas Association which has been reorganized with 80 Okmulgee district operators as members.

•

Kenneth A. Stierman, St. Louis, was recently promoted to the Engineering section of Standard Oil Company (Ohio). Stierman joined Sohio in 1951 upon graduation from Iowa State College in mechanical engineering.

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Robert L. Boggs was named assistant to **K. C. Heald**, vice president of the Gulf Oil Corporation Production department. Boggs has been with Gulf since 1927 when he became a district engineer at Tulsa. He served in various capacities in western Venezuela with both Venezuela Gulf Oil Company and Mene Grande Oil Company. From 1949 to 1951 he was vice president and director of Mene Grande. Prior to his latest promotion he was manager of western hemisphere production operations.

•

Fred M. Clement, Denver, assistant production manager of Continental Oil Company's Rocky Mountain region, was named production manager of Conoco's central region with headquarters in Oklahoma City. He joined the company in 1941 as a roustabout in the Jal, N. M. area.

E. P. Hubbard, producing operations advisor to the general manager of the Gulf Coast district, Gulf Oil Corporation, has been given the duties of division producing operations advisor to the vice president-production in Houston, succeeding **B. G. Martin**, resigned to become president and a director of San Jacinto Petroleum Corporation.

•

E. J. Theessen was recently promoted from the Paleontologist division to division stratigrapher by Shell Oil Company. Theessen is enaged at Corpus Christi, Texas, and has been with Shell for the past 16 years.

•

Joseph Neely was recently promoted from district geologist at Midland, Texas, to senior staff geologist and transferred to Magnolia Petroleum Company's general offices in Dallas.

Robert H. Multhaup has been appointed manager of the product engineering department of The M. W. Kellogg Company and will be in charge of the design and engineering of all fabricated products. Multhaup joined Kellogg last year as project engineer on rocket design work. He formerly was engaged in development work for the Elliott Company where, as manager of the laboratory, he pioneered in the design of gas turbines for marine and locomotive use. He is an engineering graduate of the University of Iowa, and the author of several technical papers.

Robert Multhaup

•

J. B. Wharton, district superintendent of Oak Canyon Field, was recently appointed executive assistant to the vice president of Western Gulf Oil Company. Wharton attended the University of California at Berkeley and has served with Belridge Oil Company. He joined Western Gulf in 1945 as field superintendent.

•

R. G. Wilson, petroleum engineer located at Snyder, Texas, for the West Texas division of The Texas Company's Producing department, was named field foreman at Snyder. A native of McPherson, Kansas, Wilson graduated from the University of Colorado before joining Texaco as a roustabout at Wichita Falls in 1948.

•

N. B. Martin, formerly staff assistant to the division producing operations advisor was recently promoted to assistant division producing operations advisor to the vice president-production in Houston.

•

Douglas H. Elliott recently left Stanolind Oil and Gas Company at Casper, Wyo., where he was serving as division photogeologist, to join Bruce Anderson, independent oil operator, and the Eagle Oil Company, both of Casper.

•

William W. Butler, geophysical supervisor of Tide Water Associated Oil Company, Houston, was awarded a life membership to the Society of Exploration Geophysicists for submitting the winning design in a contest to obtain an official crest for the society. The membership was awarded at the sixth annual Midwestern meeting at Fort Worth last month.

•

Arthur F. Turman has been appointed chief petroleum engineer for the Standard Oil Company of California, Producing department, at San Francisco. He succeeds **W. A. Eardley**, who was recently appointed manager of the Producing department's northern district at Taft. A native of Terre Haute, Ind., Turman is a graduate of the University of Chicago and joined the company in 1920 as a geologist. **J. T. Crooker**, previously supervising petroleum engineer at Taft, succeeds Turman as assistant chief petroleum engineer at San Francisco. Born in Tucson, Ariz., Crooker joined Standard of California in 1938, as an oil field roustabout.

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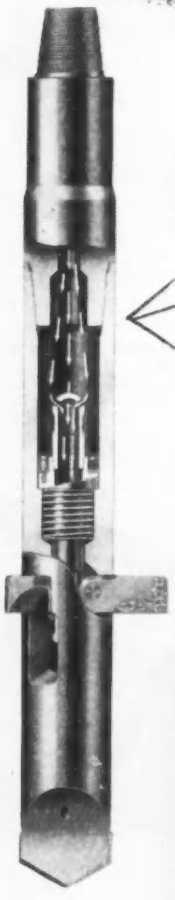

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N. C. Simpson, general manager of the Gulf Oil Corporation's Gulf Coast district has been promoted to executive assistant to the vice president - production in Houston. He will continue to act as manager of the Gulf Coast district.

N. C. Simpson

Simpson was transferred to Houston from Fort Worth and promoted to general assistant to B. G. Martin in 1950. He is a graduate of Texas A. & M. College and has studied management at the University of Pittsburgh. He joined Gulf Oil in 1933 as production engineer.

•

Glen V. Kersten, district engineer for Western Gulf Oil Company at Fruitvale Field near Bakersfield, was recently appointed superintendent of the South San Joaquin Valley area. Kersten has been with Western Gulf since 1943 and has served in various engineering capacities. He was associated with The Texas Company, Pacific Gas and Electric Company and Tidewater Associated Oil Company prior to joining Western Gulf. **John T. Rouse** and **James C. Menefee** are manager of exploration and chief geophysicist respectively, of Socony-Vacuum Oil Company's newly created exploration and producing organization in the Williston Basin and northern portion of the Rocky Mountain states.

Rouse has been chief geologist in Magnolia Petroleum's general office since 1950. Menefee has served as Magnolia's assistant director of exploration since 1946.

•

W. L. Moreman, formerly district geologist at Oklahoma City, has been advanced to staff geologist and moved to Magnolia Petroleum Company's general offices in Dallas.

•

Robert E. Dunn will join Walter Duncan's Mt. Vernon, Ill., staff as petroleum engineer. Dunn was formerly associated with the Magnolia Petroleum Company as district engineer at Salem, Ill.

•

Donald I. Lawless has been appointed manager of exploration for Canadian Bishop Oil, Ltd. Lawless, who also is chief geologist for the parent company, Bishop Oil, recently established headquarters in Calgary, Alberta.

•

Dr. Wilson S. Brubaker and **Dr. Paul Brock** have been appointed to the Engineering and Research staff of Consolidated Engineering Corporation. Dr. Brubaker was named senior research physicist. He is a graduate of Miami University, Ohio, and California Institute of Technology, and served as a research engineer on the wartime Manhattan project at the University of California in Berkeley. Prior to joining Consolidated he served for nine years as section manager, Physics department, Westinghouse Electric Corporation, in East Pittsburgh.

Dr. Brock, named engineering mathematician, received his M.S. and Ph.D. degrees from New York University. He did computation work with the Kellex Corporation, and served as senior mathematician for the Reeves Instrument Corporation.

F. W. (Dick) Borden, Los Angeles, has been named manager of the California District operations for Sunray Oil Corporation succeeding **R. E. Foss,** recently transferred to the company's general offices in Tulsa as vice president and manager of the company's exploitation department. Borden joined the company in 1930 as a roustabout, worked in various upgraded capacities until in 1945, he became production superintendent of the company's Rancho San Francisco lease at Newhall, Calif.

In 1948 Borden became general production superintendent in charge of all the company's California production operations and in 1952 was appointed general superintendent of the California district. Borden is a graduate of the University of Nebraska college of engineering.

E. W. Price, former division geologist at Oklahoma City for Stanolind Oil and Gas Company, has joined Kingwood Oil Company as chief geologist in charge of geological and exploration activities .

•

Edward P. Burtchaell, formerly with Honolulu Oil Corporation at San Francisco, is now employed as reservoir engineer in the Oil department of the Kern County Land Company at Bakersfield.

•

J. W. (Jack) Harding has resigned as assistant chief geologist, Hancock Oil Company, to enter consulting at Long Beach, Calif. Formerly he was division geologist for Union Oil Company in Santa Paula before joining Hancock. Harding graduated from University of California in 1938 and received his masters degree there in 1940.

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Dr. John M. Pearson, 48, director of production research for Sun Oil Company, died November 16 at Swarthmore near Philadelphia. Dr. Pearson held 15 patents on electrical instruments for measurement and control, and was the author of several articles on electrical measurement. He was employed by Susquehanna Pipe Line Company from 1931 to 1943, becoming manager and director of that Sun Oil affiliate. He returned to Sun Oil in 1943.

•

J. D. Baker, 54, purchasing agent for the Central division, Stanolind Oil and Gas Company at Oklahoma City, died October 28. Baker joined Stanolind in 1935 and was a member of the Purchasing Agents Association.

DEATHS

Charles S. Hill, 67, died in Chicago November 12. The immediate past president of the Rocky Mountain Oil & Gas Association, Hill was an independent oil operator in the Rocky Mountain region. He was a director of the Independent Petroleum Association of America and had been closely associated with the API. As head of the Rocky Mountain association Hill led that group's tremendous expansion. He also spearheaded the opposition to a severance tax referendum in Colorado which failed to pass in the recent election.

George L. Machris, retired president of Wilshire Oil Company, died at Los Angeles last month. One of the most noted of western petroleum pioneers, Machris, together with his brothers Victor and Alfred, founded the Wilshire Oil Company and developed it into a substantial and well integrated organization. He retired December, 1951, after devoting 37 years to the industry.

•

William McNair Welch, 78, died in Tulsa last month. A native of Oil City, Penn., Welch had done engineering and executive work with the oil and natural gas industries from 1900 until his retirement in 1948. Welch was president of White Oak and Beaver Refining Companies at the time of his retirement.

•

Andy Frank Turner, 48, first engineer at United Gas Pipe Line Company's Needville, Texas, compressor station died October 13 in Needville. Turner had been with the company for 15 years, having served at a number of locations in Houston, Dallas and Wichita Falls, Texas.

•

Robert L. Clifton, 64, former executive with The Carter Oil Company, died October 28 in Tulsa. Retiring in 1947, he had served with Carter since 1917 and had resided in Tulsa since 1921.

•

H. A. Mason, 58, assistant to the manager of laboratories with the Central Petroleum Corporation, died October 7.

Mason had been on leave from his post since January, for health reasons. He had been assistant to the manager of laboratories since 1947.

•

O. E. Castelberry, materials manager for the Mid-State Oil Company, died October 29 in Lake Village, Ark. Castelberry made his home in Tulsa.

•

Harold E. Boyd, 64, died in June. He was geologist in charge of the Michigan area for Panhandle Eastern Pipe Line Company, and was responsible for the discovery of the Howell Gas field.

•

Albert Leon Beekly, 68, of Tulsa, Okla., died September 29. He had retired two years ago after 33 years as head geologist for the Mid-Continent Petroleum Corporation and its predecessor, the Cosden Oil Company.

•

Fred H. Haggerson, 68, chairman of the board of Union Carbide and Carbon Corporation, died in New York, October 14.

Haggerson, who had been with Union Carbide for over 33 years, became chairman of the board in 1951. He had been made vice president of the corporation in 1938, a director in 1941, and president and a member of the executive committee in 1944. He promoted a liberal policy of research and expansion that has been in a large measure responsible for the growth of the Corporation.

•

Walter T. Crandall, 52, of Fort Worth, Texas, division superintendent of production for Sinclair Oil and Gas Company, died Oct. 15 in Fort Worth. He had been with Sinclair since 1929.

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waste.
Initial wells when drilled in the Sansinena field were put on the pump and
Rotary Torque Indicator Saves Drilling Costs
Trouble had been experienced with bit cones becoming detached when drilling in West Texas. Consequently, fishing jobs were necessary with the attendant loss of drilling time and additional expense.
The cause of cones breaking off was due to the fact that a cone would lock, and by additional rotation of the bit itself the jammed cone would shear-off. More often than not any indication of what had happened down the hole was not immediately apparent. A fishing job was the result.
A torque indicator will show when a cone jams, as the driller can see at once on the gage the sudden increase in the torque reading. The bit is then pulled and a fishing job has been avoided.
One company in a West Texas area spent on an average of $10,000 per well on recovering lost bit cones before the rotary torque indicator* was included as an "eye" for the driller. Since then, the cost charge against "fishing for cones" has been zero.
*Martin-Decker Hydro-Mech torque gage.
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Companies in the News

SOCONY-VACUUM OIL COMPANY, INC. is creating a new producing organization to conduct exploration and producing operations in the Williston Basin and in the northern portion of the Rocky Mountain states. Operation headquarters will be located in Casper, Wyo., temporarily. **W. W. Clawson,** chief geologist of Magnolia Petroleum Company, was named general manager of the new organization. **A. F. Barrett,** manager of the Rocky Mountaion division of General Petroleum Corporation at Casper, will be his assistant. Activities originating from the company's Calgary, Alberta, office will be coordinated with the Casper office.

•

CONTINENTAL OIL COMPANY has moved into a newly completed research laboratory at Ponca City, Okla. The laboratory is a three story, concrete building with 40,000 square feet of floor space. In addition to "comfort" conditioning, several areas have special temperature and humidity control, as the infra-red spectrographic laboratory which is held at 40 percent relative humidity and 70 plus-or-minus 1°F. The building has no fixed partitions but is fitted with moveable steel sections.

•

LION OIL COMPANY has reorganized its operations to include a new production and exploration division. The change was designed to provide closer coordination of activities within the company's growing fields of operations. With headquarters in El Dorado, Ark., the new division will be under the direction of **John E. Howell,** company vice president and general manager for the division. **R. T. Ellzey** was named manager of land; **E. D. Klinger,** chief geologist; and **F. E. Steele,** general superintendent of oil production.

In addition operations have been divided into four regions as follows: Rocky Mountain, **C. L. McArthur,** manager; Southwestern, **F. H. McGuigan;** Central, **R. I. Williams;** Southern, **Bert Gamble.**

•

ANDERSON & COOKE, oil exploration consultants, have opened offices in the San Jacinto Building, Houston. Offering exploration service, oil and gas prospects, seismic surveys, geological and geophysical interpretation and reinterpretation, well service and general exploration program management. John F. Anderson and W. F. (Bill) Cooke, Jr., the partners, offer a combined 30 years experience.

•

L. W. BAKER DRILLING COMPANY is the name of the reorganized O'Rourke-Baker Drilling Company which has been dissolved. Baker has opened offices in the First National Building, Tulsa, and will operate rotary drilling rigs in Oklahoma and possibly Kansas.

SAN JACINTO PETROLEUM CORPORATION has moved its principal offices from Dallas to Houston, with offices located in the San Jacinto Building. **B. G. Martin** has been elected president and director of the company and will resign his position as assistant to the vice president of Gulf Oil Company.

B. G. Martin

San Jacinto Petroleum Corporation was created in 1950 to acquire the bulk of the properties formerly held by Atlatl Royalty Corporation which company was owned by E. De Golyer of Dallas. Since purchasing the Atlatl properties, the company has acquired substantial additional holdings of producing and non-producing properties in the San Juan Basin area, the Williston Basin, and Texas. Most of the company's producing properties are located on the Gulf Coast.

Principal stockholders of the company are J. H. Whitney & Company, private venture capital investment firm, and White, Weld & Company, investment banking firm, of New York. The move to Houston was made to facilitate operations as most of their producing properties are in that area.

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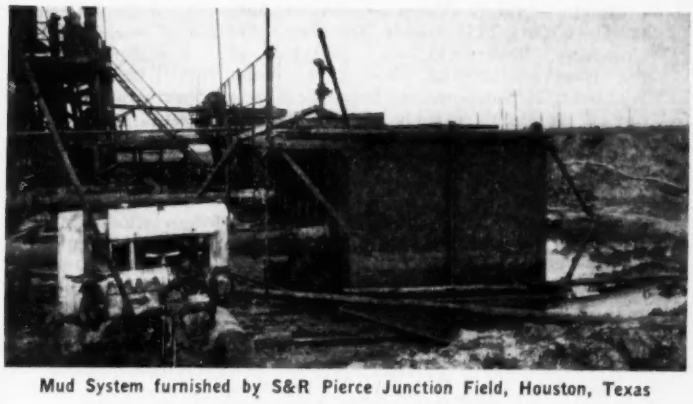

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Association News

Geologists Schedule Houston For Annual Meeting in March

The Houston Geological Society will be host to the joint annual meeting of the Society of Economic Paleontologists and Mineralogists, the Society of Exploration Geophysicists and the American Association of Petroleum Geologists next March 23-26.

Attendance at this meeting is expected to exceed 10,300 members of the combined societies. The program will present latest improvements in products and services offered this branch of the petroleum industry. Meetings and exhibits will be held in the Sam Houston Coliseum.

Three Pacific Coast Geological Societies Elect 1953 Officers

Three Pacific Coast geological sections recently elected officers to serve for the 1953 year. The American Association of Petroleum Geologists' slate is composed of members living in Los Angeles. Russell R. Simonson, The Ohio Oil Company, is president; Rufus M. Smith, Continental Oil Company, vice president; Robert G. Maynard, Sunray Oil Corporation, secretary, and Tom E. Folsom, Honolulu Oil Corporation, treasurer.

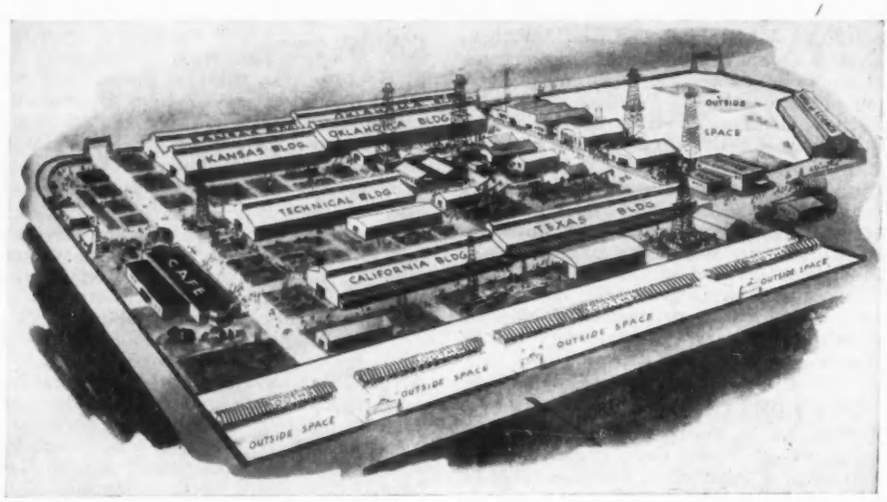
The Society of Exploration Geophysicists named Robert B. Galeski, Honolulu Oil Corporation, Bakersfield, Calif., as its 1953 president. Carl Savit, Western Geophysical Company, Los Angeles, was named vice president of the Southern district. William D. Cortright, Tide Water Associated Oil Company, Bakersfield, vice president of the Northern district. Robert J. Wells, Richfield Oil Corporation, Bakersfield, was named secretary-treasurer.

The Society of Economic Paleontologists and Mineralogists elected Orville L. Bandy, University of Southern California's Geological department, president. Dana B. Braislin, Jr., Union Oil Company, Compton, Calif., was named secretary-treasurer.

Oil Recovery Conference Scheduled December 11-12

The Fifth Oil Recovery Conference, sponsored by the Texas Petroleum Research Committee, will be held at the Memorial Student Center, Texas A. & M. College, College Station, December 11-12.

IPAA OFFICERS Charlton H. Lyons and J. P. Coleman are shown at the 23rd annual meeting held in Oklahoma City recently. Lyons, left, an independent oil man of Shreveport, was re-elected president of the association. Coleman, Wichita Falls, Texas, was elected head of the National Stripper Well Association. Close to 1500 independent oil men attended the meeting.



"SOLD OUT," SPACE FOR 1953 IPE is indicated by shaded areas in this reproduction of the layout for the Exposition which will be held in Tulsa next May 14-23. A new four-acre north section has been acquired and will be made available to further exhibitors. The addition will include 100 sheltered booths as well as open-air exhibit space.

6400 API Delegates Reelect Wescoat, Porter

With a record breaking 6400 registrants, the American Petroleum Institute held its 32nd annual meeting in Chicago last month and re-elected L. S. Wescoat, president of The Pure Oil Company, chairman of the API board of directors. Frank M. Porter, president of Fain-Porter Drilling Company, was re-elected president.

Vice presidents elected included John G. Pew, vice president, Sun Oil Company, Production; P. C. Spencer, president of Sinclair Oil Corporation, New York, Transportation (re-elected); John G. Newton, vice president, Magnolia Petroleum Company, Beaumont, Texas, Refining; and Robert M. Bartlett, vice president, Gulf Oil Corporation, Pittsburgh, Marketing.

B. Brewster Jennings, president of Socony-Vacuum Oil Company, Inc., was re-elected treasurer, and Lacey Walker, of New York, was re-elected secretary and assistant treasurer.

At the group session on fundamental research, Dr. Robert E. Wilson, chairman of the board, Standard Oil Company (Ind.), and chairman of the research committee of the API board of directors, presented API's "Certificate of Appreciation" in recognition of meritorious service and contributions to the work of the Institute and the oil industry to the following persons:

Kenneth C. Heald, Gulf Oil Corporation; Charles V. Millikan, Amerada Petroleum Corporation; A. E. Miller, Sinclair Refining Company; and W. J. Sweeney, Standard Oil Development Company.

C. Z. Hardwick, vice president and director of The Ohio Oil Company, and Oil Industry Information Committee national chairman for 1952, presented certificates to the following men at the OIIC sponsored public relations session:

Walter E. Black, Esso Standard Oil Company; Ralph F. Carey, Shell Oil Company; Madison Farnsworth, Gulf Oil Corporation; Thad E. Horton, The Texas Company; George B. McDaniel, Socony-Vacuum Oil Company, Inc.; George F. McMillan, Gulf Oil Corporation; Harry E. Milton, Milton Oil Corporation; R. T. Seidel, Shell Oil Company; E. L. Stauffacher, Cities Service Oil Company; and Harry A. Trower, Tulsa, Okla.

Receiving certificates for contributions to safety were R. T. Henderson, retired, The Standard Oil Company (Ohio); George F. Prussing, consulting engineer; H. J. Wilson, Tide Water Associated Oil Company; and B. A. Moeller, General Petroleum Corporation.

Certificates were also awarded to James J. Cosgrove, Continental Oil Company, who is a member of American Petroleum Industries Committee, and to J. C. Anderson, Standard Oil Company (New Jersey), who is a member of the financial and accounting committee.

Following a report by the board of councillors, the general session elected the 1953 board of directors. Serving for the first time are: R. M. Bartlett, Gulf Oil Corporation; Davis Bovaird, Bovaird Supply Company; Z. K. Brinkerhoff, Jr., Brinkerhoff Drilling Company; James E. Dyer, Sinclair Oil Corporation; Paul Endacott, Phillips Petroleum Company; Otto Hammer, Security Engineering Company; James W. Liddell, Continental Oil Company; Gage Lund, Standard Oil of California; R. L. Milligan, The Pure Oil Company; John W. Newton, Magnolia Petroleum Company; M. J. Rathbone, Standard Oil Company (New Jersey); Roland V. Rodman, Anderson-Prichard Oil Corporation; T. E. Swigart, Shell Pipe Line Corporation; W. K. Whiteford, Gulf Oil Corporation; and R. F. Windfohr, Nash & Windfohr.

OIIC Program Approved

The OIIC program was formally approved by the board of directors who voted the Committee's continuance through 1953. The OIIC budget was set at approximately

$2.9 million, an increase of seven percent over 1952 budget. Charles Z. Hardwick, The Ohio Oil Company, national OIIC chairman for 1953, and Stanton K. Smith, Smith Oil and Refining Company, chairman-elect for 1953, announced that all OIIC projects now in existence will be expanded and intensified.

AGA Names Horton Director; McCandless Is Promoted

American Gas Association recently named a new director and an assistant to the managing director of the organization.

J. K. Horton, president of Pacific Public Service Company, San Francisco, was named director to succeed Ernest G. Lawson, resigned. Horton, a graduate of Stanford University, began his career with Shell Oil Company while studying law. In 1941 he was admitted to the California Bar Association and practiced in San Francisco. Since that time he has been associated with Coast Counties Gas & Electric Company and Pacific Public Service Company in executive capacities.

Bruce A. McCandless, formerly assistant to the director of the AGA Laboratories in Cleveland, was named assistant to the managing director at Los Angeles. He graduated from Purdue University with a chemical engineering degree and joined the National Carbon Company upon graduation. He has been associated with AGA Laboratories since 1939 with the exception of five years spent in the Army during World War II.

AIME Elects Hocott Chairman Petroleum Branch at Meeting

Highlighting a successful meeting of the Petroleum Branch of American Institute of Mechanical Engineers, held in Houston, in October, was the election of 1953 officers. Claude R. Hocott, assistant head of Production Research, Humble Oil & Refining Company, Houston, was elected chairman of the Petroleum Branch. Two vice chairmen elected were Basil P. Kantzer, Union Oil Company of California, Los Angeles, and John P. Hammond, Amerado Petroleum Corporation, Tulsa. New executive committeemen elected were Roland Bouldy, Hull-Silk Repressuring Association, Wichita Falls, Texas, and Thomas A. Atkinson, General Petroleum Corporation, Casper, Wyo.

William K. Whiteford, executive vice president, Gulf Oil Corporation, Pittsburgh, gave the welcoming address to open the three-day technical sessions. His subject, "The Engineer's Stake in the Percentage Depletion Controversy" was a strike back at current criticism of the oil industry by the U. S. Government.

Of particular interest to oil men were the comments of Walter J. Levy, New York economic advisor and petroleum consultant for both private industry and government. Speaking on "Perils to the Free World's Essential Oil Supplies," he pointed out the complexities of postwar operations in foreign countries. " . . . there is a growing desire of various oil-producing countries to subject their oil resources to their own oil policies implemented by direct national control." Levy said.

Forty-one outstanding technical papers were presented by the Technology Committee directed by Douglas Ragland, Humble Oil & Refining Company, Houston.

TULSA GEOLOGISTS recently elected new officers for the 1952-53 term at their fall meeting. This unit, which numbers 700 members, is considered "Number One" in the association. Back row, left to right: Paul H. Reisher, Gulf Oil Corporation, councilman; V. T. (Jack) Frost, The Ohio Oil Company, immediate past president; Robert E. Megill, The Carter Oil Company, business manager. Front row, left to right: Myron C. Kiess, Mid-Continent Petroleum Corporation, first vice president; Mrs. H. V. P. Branson, Shell Oil Company, editor DIGEST; Dan C. Busch, Zephyr Petroleum Corporation, president; Rex Benway, Schlumberger Well Survey Corporation, second vice president.

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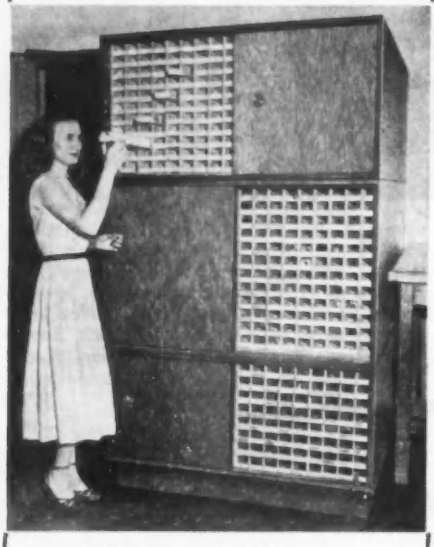

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The utility of the horizontal sectional type filing gives the definite advantage of large capacity within minimum floor space. Cabinet sections, when placed upon base, file 800 to 1000 maps in 16 square feet of floor space. No tubes to wedge maps or make them difficult to handle. The drawer-like slide eliminates injury to maps.

COMPARE THESE SEVEN ADVANTAGES

★ Convenient ★ Instant filing
★ Space-saver ★ Dust proof
★ Instant reference ★ Meddle proof
★ No tubes

No more ragged lengths; the 2 x 2 inch square compartments create a systematic and neat filing arrangement.

Exterior of cabinets are of ¾ inch five-ply, beautifully grained hardwood with mitered lock joints. Sliding doors are individually locked and keyed.

Cabinet finishes are available in Walnut, Oak, Mahogany, Olive Drab, Cabinet Grey, Natural or Blond wood.

Prices

Capacity	*Price*
100	$175
200	$265
200	$295

(Base $12.50 extra)
Index Label Holders 16c ea. Installed

Dimensions

Height	*Width*	*Length*
13"	50¼"	46¼" (44" map)
23½"	50¼"	46¼" (44" map)
23½"	50¼"	50¼" (56" inside)

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AT OKLAHOMA CITY the American Association of Oilwell Drilling Contractors recently met in annual session to elec their 1952-53 officers. Seated, left to right: J. W. Hall, Trinity Drilling Company, Odessa, Texas, vice president for West Texas and New Mexico; Stuart G. Noah, The Noah Drilling Company, Albion, Ill., vice president for Illinois, Michigan, Indiana and Kentucky; C. F. Whaley, Chet Whaley Drilling and Well Servicing Company, Houston, vice president at large; A. W. Thompson, Thompson-Carr, Inc., Houston, immediate past president; F. W. Brigance, Rowan Drilling Company, Fort Worth, president; Brad Mills, A. A. O. D. headquarters, Dallas, executive vice president; and Earle C. Flesher, Johnson & Flesher, Oklahoma City, vice president for Central Mid-Continent.

Standing, left to right: H. H. Hillman, California Production Service Inc., Long Beach, Calif., vice president for Well Servicing; John M. Grant, Loffland Bros. Company, Los Angeles, vice president for California; K. L. Kellogg, K. L. Kellogg & Sons, Compton, Calif., secretary; Marion S. Church, Dallas, general counsel; Louis A. Beecherl, McDaniel & Beecherl, Dallas, treasurer; and, John B. Holmes, Holmes Drilling Company, Houston, vice president for Gulf Coast.

Those officers not present for picture were: Harold M. McClure, Jr., McClure Drilling Company, Alma, Mich., vice president for Cable Tools; N. H. Wheless, Jr., Wheless Drilling Company, Shreveport, La., vice president for Cretaceous and Tertiary Basins; and Walter G. Tschudin, Pioneer Drilling Company, Inc., Casper, Wyo., vice president for Rocky Mountains.

PANEL MEMBERS on the Williston Basin information tour were, left to right, C. F. Smith, assistant general superintendent of Standard Oil Company (Indiana), Whiting refinery, refining; Gordon C. Locke, executive secretary and associate counsel, Committee for Pipe Line Companies, transportation; E. R. Shorey, Jr., mechanical engineer, Shell Oil Company, production; Charles S. Agey, assistant chief geologist, Amerada Petroleum Company, exploration; C. W. Nelson, assistant economist, Federal Reserve Bank of Minneapolis, economics; and moderator T. N. Jordan, president of Illinois Southern Oil & Gas Company.

Geologists Collecting Fund For New Tulsa Headquarters

The American Association of Petroleum Geologists has announced early construction of a headquarters office building in Tulsa. The building will be an L-shape formation, 100 feet along the front and 70 feet wide, made of structural steel and finished in buff brick and cut stone trim. The building fund has been started with contributions from the treasuries of the Tulsa Geological Society and the Pacific section of the association.

Fort Worth Landmen Elect Officers for New Association

The Fort Worth Landmen's Association has been organized with Hamilton Rogers, Rowan Oil Company, president; Lee Cornelius, Gulf Oil Corporation, first vice president; T. M. Cady, Continental Oil Company, second vice president; Lanie A. Finley, Rowan Oil Company, secretary and Melvin M. Slagle, Jr., Texas Pacific Coal & Oil Company, treasurer.

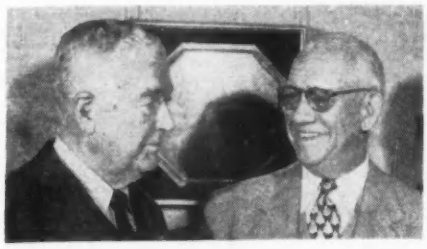
Sponsored by more than 50 Fort Worth landmen, the Association will work for improving standards of landmen in the industry and for the dissemination of information generally concerning the oil and gas industry and the integral part played in the industry by landmen.

The executive committee includes E. D. Coady, Southern Production Company; Tom Murphy, Jr., The Texas Company; Bert M. Nunnallee, Midwest Oil Corporation; T. F. Palmer, Sinclair Oil and Gas Company, and A. T. Remington, The Pure Oil Company.

Southwestern Legal Foundation Announces 1953 Institute Date

The Southwestern Legal Foundation, Dallas, will hold its fourth annual Institute on the Law of Oil and Gas and Taxation, January 21-23, 1953, presenting outstanding experts as lecturers for each field. The institute will deal with the economics of the oil and gas industry, various legal problems, federal regulation, contracts, and other involved aspects of administration.

More than 600 oil and gas lawyers, tax specialists and executives attended the January, 1952, Institute. Inquiries should be directed to the Southwestern Legal Foundation, Hillcrest at Daniels, Dallas 5.



ACCEPTING AN AWARD for activity in home safety education during the past year, Charles E. Bennett, president of The Manufacturers Light and Heat Company, Pittsburgh, and president of the American Gas Association, grinned broadly at Lee Warren James, chairman of the board of trustees of National Safety Council, as he made the award and citation.

Exploration Geophysicists Announce 1953 Nominee Slate

Results of a mailed ballot to elect the 1953-54 slate of officers for the Society of Exploration Geophysicists will be announced in February, 1953. Nominees for president are Kenneth E. Burg, Geophysical Service, Inc., Dallas, and Roy L. Lay, The Texas Company, Houston.

Vice presidential nominees are Dr. Karl Dyk, Stanolind Oil & Gas Company, Tulsa, and Eugene W. Frowe, Robert H. Ray Company, Houston. Nominees for secretary-treasurer are W. B. Robinson, Tulsa division of Gulf Research and Development Company, and Bart W. Sorge, United Geophysical Company, Pasadena, Calif.

For the two-year term as editor Dr. Milton B. Dobrin, Magnolia Petroleum Company, Dallas, opposes Dr. L. Y. Faust, Amerada Petroleum Corporation, Tulsa.

NACE Schedules Educational Lectures for March Session

Three educational lectures on corrosion fundamentals will be featured at the March 16-20, 1953, conference of the National Association of Corrosion Engineers in Chicago. This feature is in addition to a proposed program of 11 symposia and two round table discussions.

A few of the symposia planned, with names of chairmen where appointed, are as follows: Cathodic Protection, E. P. Doremus, Cathodic Protection Service, Houston; Corrosion Principles, chairman not appointed; Fresh and Salt Water Corrosion, V. V. Kendall, National Tube Division, United States Steel Company, Pittsburgh; High Temperature Corrosion, J. J. B. Rutherford, Babcock & Wilcox Company, Beaver Falls, Penn.; Oil and Gas Production Industry, H. L. Bilhartz, Atlantic Refining Company, Dallas; Pipe Line Industry, chairman not named.

Round table discussions will be held on pipe line and general corrosion problems.

IPE Committees Hard At Work Organizing 1953 Exhibition

Top petroleum scientists and technologists will pool their know-how in assembling displays for the Hall of Science at the thirtieth anniversary International Petroleum Exposition next May 14-23 at Tulsa. Startling process in petroleum technology, resulting from research expenditures exceeding those reported by any other industry, has challenged IPE to tell the complete story of applied science in the oil industry.

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News of Service and Suppliers

Chiksan Establishes New Canadian Subsidiary at Brantford, Ontario

Chiksan Company has established a wholly-owned Canadian subsidiary which will operate as Chiksan of Canada, Ltd., at Brantford, Ontario. A new plant will be built at Brantford and is scheduled to begin manufacture of ball-bearing swivel joints upon completion. The Canadian plant will also manufacture various items produced by Well Equipment Manufacturing Division of Chiksan.

Officers of the new Canadian subsidiary are: H. J. Hagn, president; Frank Burrill and G. R. Winder, vice presidents; and K. K. Knutzen, secretary-treasurer.

Keystone Tool Appoints New Representative in East

R. J. Eiche and Associates with headquarters in Los Angeles, has been named representatives for Keystone Tool Corporation, Houston. Eiche maintains sales offices in New York, Buffalo, Boston, Chicago, Detroit, Cleveland, Cincinnati and Pittsburgh. They will handle Keystone butterfly valves and other Keystone products.

Hamer Oil Tool Company, Long Beach, Calif., has opened new Keystone sales and service offices in Ventura and Oakland, Calif.

New Los Angeles Research Unit Opened by Western Geophysical

Western Geophysical Company has moved its Los Angeles research department into a newly constructed and fully modern building on North La Brea Avenue, Los Angeles. The new research building features an electronics research laboratory, shop facilities for the assembly and testing of all instruments and equipment required for geophysical prospecting and exploitation of new ideas. Western now has 53 geophysical crews in the field, mostly in the U. S. and Canada.

E. D. Tull Appointed to Fill New Executive Post at Cummins Engine

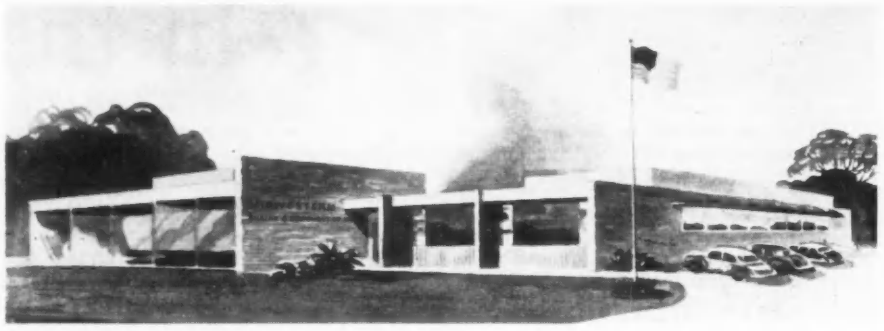
E. D. (Don) Tull has been named to the newly created position of vice president and general manager of Cummins Engine Company, Inc., at Columbus, Ind.

A native of Columbus, Tull has been with Cummins since 1928. In February, 1952, he was named vice president of personnel and plant, and more recently he was elected to the Cummins board of directors. His new capacity will be to coordinate the work of the company's five divisions.

E.D. Tull

Bethlehem Assigns Engineer

James R. Rapier has joined Bethlehem Supply Company as engineering representative with headquarters in Tulsa.



A NEW $100,000 FACILITY for distribution of pipe line supplies and equipment has been opened by Midwestern Engine & Equipment Company at Tulsa. Offices, warehouse and repair depot are included under one roof providing great coordination between departments. Extensive use of plate glass and Fiberglas products is featured in this fireproof building.

INCREASED DEMAND FOR OIL TOOLS necessitated increased space at Page Oil Tool Company, Long Beach, Calif. The company recently completed an expansion of its California factory to facilitate further production of Page tubing anchors, oil and gas separators, tubing drains, packers and other Page equipment. In addition, greater field representation has been set up to operate from sales and service offices located at Long Beach, Oklahoma City and New York.

Ira Wells Named McEvoy Company Rocky Mountain Representative

McEvoy Company, Houston, recently named Ira C Wells as its Rocky Mountain sales representative. Wells will cover Colorado, Wyoming, Montana, Utah, North and South Dakota from his headquarters at Williston, N. D.

While Wells joined McEvoy only recently, he has been engaged in oil field supply work for the better part of his life. He is acquainted with the work in the Mid-Continent area, West Texas, and the Gulf Coast.

Ira C. Wells

Fred E. Cooper Appoints Gasche New Vice President and Manager

Fred E. Cooper, Inc., has named Louis M. Gasche vice president and assistant manager. Gasche has been with the company as a sales engineer since 1938, with the exception of a period spent with the Army at the Aberdeen Proving Grounds as plant equipment engineer. He is a mechanical engineering graduate of Kansas State College.

Wilson Supply Names Harris As Southwest Texas Manager

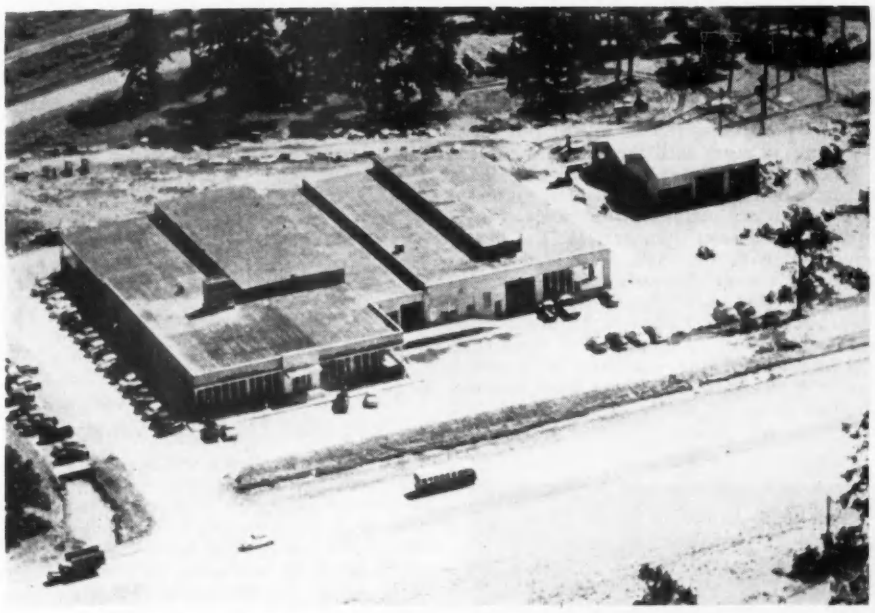
Recently transferred from his capacity as store manager for the Wilson Supply Company store at Beaumont, Texas, Wayne H. Harris has been named district manager of the southwest Texas area and will make his headquarters at Victoria, Texas. In the southwest Texas area, Wilson Supply Company maintains stores at Bay City, Columbus, Victoria, Corpus Christi and Alice.

J. T. Watson, named manager of the Beaumont store, was transferred from New Iberia, La., while Gordon Arceneaux, formerly manager at Lake Charles, La., was moved to New Iberia. Jack Collins was transferred from Houston to Lake Charles as store manager there.

Wayne H. Harris

Bonding Agents License Signed

ChemoTec Division of the Eutectic Welding Alloys Corporation will manufacture and market a line of new organic metallic bonding agents under license from Ciba Company Incorporated.



NEW CATERPILLAR DISTRIBUTOR is the Mustang Tractor and Equipment Company of Houston, pictured above. Mustang succeeds Gulf Tractor & Equipment Company and will maintain facilities at 6946 Katy Road as distributor in the 34-county area surrounding Houston. Otis Massey, mayor of Houston from 1943 to 1945, is president of Mustang; Frank L. Tucker, vice president of sales and advertising; Earl C. Calkins, vice president in charge of service and parts.

Massey is also president of Otis Massey Company, Ltd., and until recently headed Asbestos Company of Texas.

Baroid Processing Plant Being Constructed at Corpus Christi

Construction has begun on a new Baroid Sales division processing plant and warehouse in Corpus Christi, Texas. The new plant, which is expected to start operation on January 1, 1953, will produce 5000 tons of Baroid a month. National Lead Company, the parent company, leased approximately 15 acres of navigation district land, including 600 feet of waterfront for a dock and unloading facilities, from the Port of Corpus Christi.

The mill will process barytes ore received by rail, barge, and ocean-going vessels. The location is on a deep-water site which permits Baroid Sales Division to bring in its own material by ship and to supply offshore drilling operations from its own dock. A warehouse for other oil well drilling mud products and chemicals of the Baroid Sales Division line will be erected adjacent to the new plant.

Chuck Holcomb Promoted by WECO

C. J. (Chuck) Holcomb, only recently transferred to Well Equipment Manufacturing Corporation's home office in Houston from Corpus Christi, has been made an industrial sales representative. In his new capacity, Holcomb will contact industrial firms, refineries and chemical plants throughout the Gulf Coast and Mid-Continent areas for WECO.

BJ Opens Two Rocky Mountain Stations to Pace Oil Activity

New stations at Williston, N. D., and Glendive, Mont., have been opened by BJ Service, Inc., Long Beach, Calif., to keep pace with increased oil activity in the Rocky Mountain area. Curtis M. Jenkins has been given charge of operation at Williston, while L. N. Tholkes is directing the Glendive station.

Pelton Water Wheel Assigns Four To Texas and California Districts

Pelton Water Wheel Company has appointed four men to positions in its Oil Industry Machinery division field sales organization.

Clyde Lietzow, the new manager of the Dallas office at 1122 Jackson Street, has worked in Pelton Sales and Service departments in California during the past six years. He is a graduate in mechanical engineering of the University of Michigan.

Tom Garrison is California sales and service engineering working out of the Los Angeles office, replacing Lietzow.

W. A. McKnight now directs activities at Pelton's Houston office, 1817 First National Bank Building.

Managing the Odessa, Texas, office at 402 West Second Street is Gene Ball, assisted by N. N. (Gene) Bagley.

Crutcher-Rolfs-Cummings Names McKinney Supply Division Manager

I. W. McKinney has been appointed manager of the new Crutcher-Rolfs-Cummings, Inc., Supply division.

I. W. McKinney

Before joing C-R-C McKinney was in the Valve division of Cameron Iron Works, Inc. He was formerly a field engineer and metal inspector for Humble Oil & Refining Company at Baytown and a pipe line engineer for Humble Pipe Line Company.

The new C-R-C division will carry a complete line of pumps, valves, fittings, and hand tools.

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PESA Presents Honor Scroll To Faulkner, Director Emeritus

David S. Faulkner, retired vice president of The National Supply Company, last month was presented a scroll honoring his achievements in the supply industry and noting the fact that he is first Director Emeritus of the Petroleum Equipment Suppliers Association. This was the first such honor to be conferred on anyone by the Association.

Last June, during the annual meeting of the PESA at San Francisco when Faulkner was elected first Director Emeritus of the association, the scroll was voted by the membership. It was presented by the Pacific district section.

Baker Oil Tools Recognizes Ted Sutter's Service Record

Ted Sutter, general manager and executive vice president of Baker Oil Tools, Inc., recently received a service award pin representing 30 years with the company.

Sutter joined Baker Oil Tools in 1922 as office manager and has held a number of key positions including that of secretary-treasurer and sales manager. He has been associated with the API, Petroleum Production Pioneers, Nomads and Petroleum Equipment Suppliers' Association.

Fifty-five Baker employes of the Western division and 29 employes of the Central division of the company were presented with awards signifying from five to 25 years service.

Charles Talbot

John Tobler

Talbot Named Production Manager For Magcobar Plants and Mines

Two important staff changes have been announced by Magnet Cove Barium Corporation. Charles E. Talbot has been appointed general production manager and will direct all plants and mines of the corporation. He will make his headquarters in Houston. Talbot joined Magcobar in April as general production manager. He had previous experience as plant manager for Tennessee Products Corporation and as assistant manager of the southwest division of the H. K. Ferguson Construction Company.

John Tobler has been named general superintendent of the mine and mill at Malvern, Ark. A specialist in underground mining operations when he joined Magcobar in December, 1948, Tobler was most recently working as superintendent of the Malvern mine. His previous experience includes employment with Inland Steel Company, Black Hawk Mine in New Mexico, and Miami Copper Company at Miami, Ariz.

United Supply Names Manager Of Ardmore, Okla., Store

H. H. Rakestraw has been appointed by United Supply and Manufacturing Company of Tulsa to manage the firm's newest oil supply store located in Ardmore, Okla.

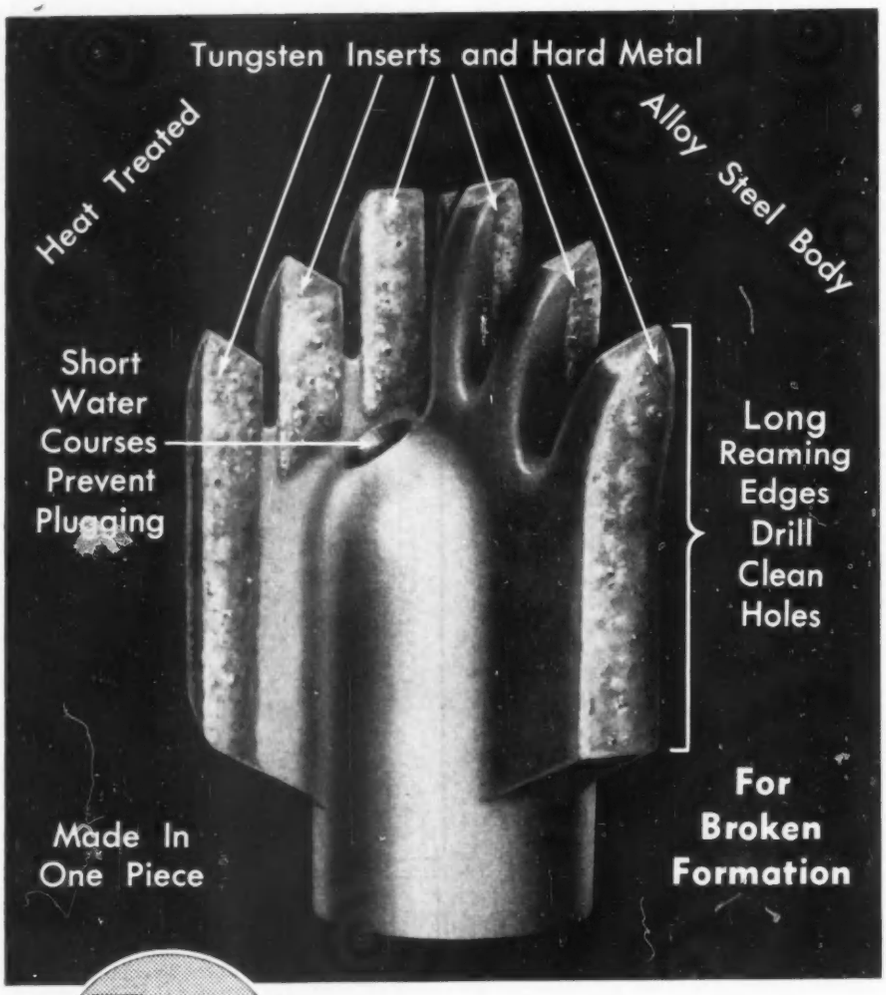
H. H. Rakestraw

Rakestraw, a sales representative in West Texas prior to his appointment had previously been a store manager in Ringwood, Okla.

Other men who will be active in the Ardmore store are Donald DuFor and Don MacKey. Resident district manager for the area served by the new store will be A. R. Brown.

Alden Loosli Named Assistant to General Manager for Cyanamid

Alden R. Loosli has been named assistant to the general manager of American Cyanamid Company, effective January 1. Loosli, who holds a B.S. degree in Physical Sciences from the University of Chicago, and is a graduate of the Advanced Management Program, Harvard Graduate School of Business Administration, joined Calco in 1937 as a student trainee. Since 1950 he has been assistant manager of the Intermediate and Rubber Chemicals Department.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Houston, Tex.

Spinks Tool & Supply Co.
Monahans, Tex.

Walker Welding Works
Seminole, Tex.

M & N Welding Works
Lubbock, Tex.

O'Tool Bit & Machine Co.
Lubbock, Tex.

Harry Junker
Kemmerer, Wyo.

Holdridge Welding Shop
Lubbock, Tex.

San Juan Tool Co.
Aztex, New Mex.

Exploration Equip. Co.
Houston, Tex.

Bethlehem Supply Operating Store in Williston Basin Area

Bethlehem Supply Company is now operating a new supply store near Tioga, N. D. This new Bethlehem installation was an early major supply company store to locate in the heart of the Tioga-Beaver Lodge area of the Williston Basin. D. B. Afflack, formerly store manager at Great Bend, Kansas, is the manager.

Merritt-Chapman & Scott Names E. W. Hammer Construction Manager

E. Walter Hammer has been appointed manager of the industrial and building construction division of Merritt-Chapman & Scott Corporation, replacing Myles C. McGough. Hammer joined the organization in 1935 as project manager and in the ensuing ten year period through 1945 directed construction by M-C&S throughout the U. S. In 1945 he joined Starrett Bros. & Eken as vice president in charge of construction operations in the eastern U. S., returning to M-C&S only this year.

L. T. Ferguson

C. A. Teel

Guiberson Corporation Transfers Three Representatives in Texas

R. Z. (Bob) Mendenhall, Southwest Texas representative for The Guiberson Corporation, has been transferred to Corpus Christi, Texas. Mendenhall has been headquartered at Victoria, Texas, for more than two years.

C. A. (Cliff) Teel, West Texas representative, has been transferred to San Angelo, Texas, from Odessa, his headquarters for the past two years.

L. T. Ferguson, Tri-State area representative, has been transferred to Odessa. Ferguson, who has been with Guiberson 11 years, was replaced in the Tri-State area by W. V. Phillips. Phillips will have offices at Salem, Ill.

R. Z. Mendenhall

Allis-Chalmers Names Gillespie Manager of Paris Tractor Office

George A. Gillespie, Tractor Division of Allis-Chalmers Manufacturing Company, has been appointed resident manager of the Paris, France, office and will supervise sales of Tractor Division products in Europe. Gillespie was advanced from his former capacity as territory sales manager for Europe, North Africa and the Middle East with headquarters in Milwaukee, Wis. He succeeds Otto Veit, retired.

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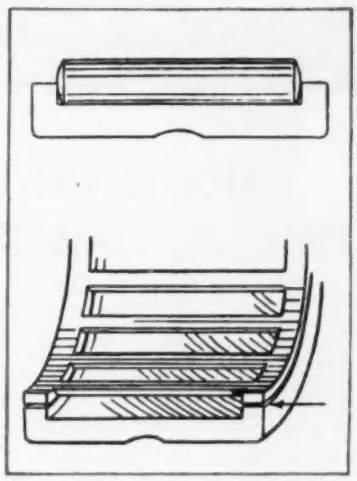

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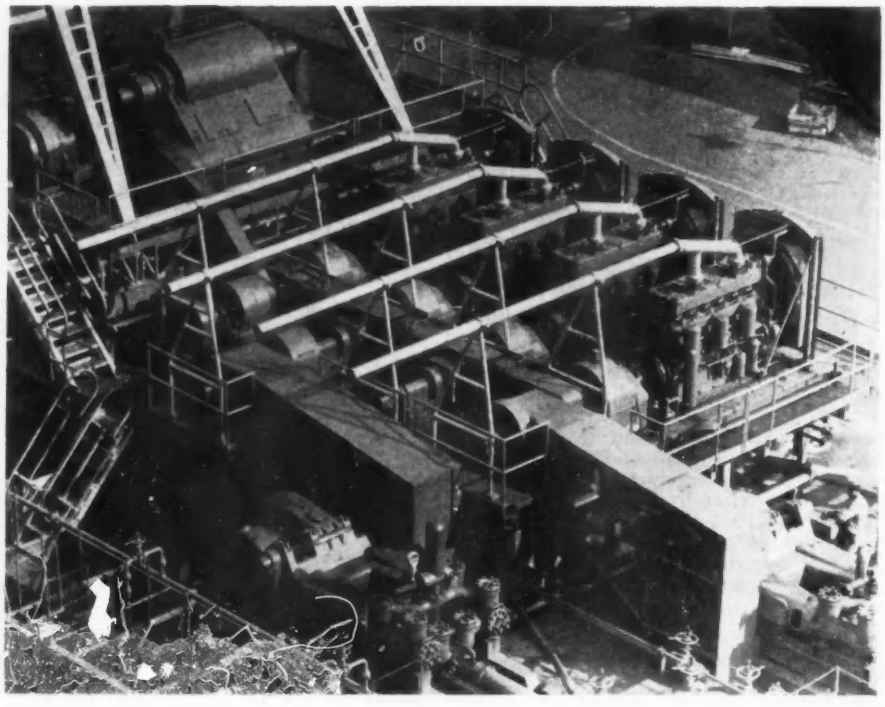

BEING INSPECTED before shipment to Australia for use by the West Australian Petroleum Proprietary, Ltd., is a National Supply Company drilling rig and equipment capable of reaching 16,000 feet. An Ideal Type 130 rig was selected for the job and set up at the California Texas Oil Company plant at Torrance, Calif., for inspection and tests before shipment. The first well probably will be drilled about 200 miles north of Carnarvon, Australia, under the direction of Carl Newcomb, a veteran wildcatter.

Jarecki International Supply Names Suder as General Manager

F. E. Suder has been named general manager of the Jarecki International Supply Division of H. K. Porter Company, Inc., Dallas. Suder, formerly sales manager of the division, will be in complete charge of Jarecki International operations. His experience covers 35 years in various phases of the oil and gas industry, including sales and management positions with National Supply Company and International Derrick and Equipment Company. He has been with Jarecki International since 1951.

A. M. Lockett Names Mendow, Wyler in Recent Advancement

F. Robert Mendow, Tulane University graduate in mechanical and electrical engineering, has been appointed chief engineer of A. M. Lockett & Company, New Orleans. Mendow joined Lockett in 1931 as a junior engineer. For the past several years his main activity has been promotion for boiler sales and engineering.

Charles J. Wyler was named executive assistant to the vice president in charge of engineering for Lockett. He is a graduate of Tulane University in mechanical and electrical engineering who joined Lockett in 1919. For several years he directed the Lockett machine shop and has specialized in design and estimate of Lockett fuel oil pumping and heating sets for industrial applications.

Lyons Heads Mixer Division

General American Transportation Corporation has appointed Emerson J. Lyons general manager of the Turbo-Mixer Division. Lyons, who succeeds James E. Moul, retired, has offices in New York.

Rockwell Names L. A. Dixon, Jr. Executive of Valve Division

L. A. Dixson, Jr., new vice president of Rockwell Manufacturing Company's Meter and Valve Division, will coordinate the sale and manufacture of the division's products. A graduate of Pennsylvania State College, Dixon has devoted his time to the meter industry since graduation.

Three A. O. Smith Employes Named in Recent Promotions

T. A. Sullivan, for the past year supervisor of order service in the A. O. Smith Corporation's Process Equipment Division, has been named product manager for the pressure vessels in the division.

R. T. Springate has joined the Process Equipment Division as superintendent of production control. Springate had been factory manager of the A. O. Smith Truck Frame Division.

Succeeding him in the truck frame post is T. E. Dillon, formerly manager of manufacturing for the passenger frame plants.

McCullough Tool Opens Canada Service Branch in Alberta

Grande Prairie, Alberta, is the site for the latest service branch to be opened by the Canadian Division headquarters of the McCullough Tool Company of Edmonton. John H. Williams, a veteran of 19 years in Canadian oil fields with supplementary service in Trinidad, B. W. I., has been assigned manager of the new station. He joined McCullough in 1951 as a field service engineer working out of McCullough headquarters in Edmonton. Grande Prairie is the third Canadian service branch opened within the past three months, the others being at Regina, Saskatchewan, and Edmonton, Alberta.

E. G. Ellis

J. L. Peeler

Cummins Sales & Service Announces Advancement of Ellis and Peeler

E. G. Ellis has been promoted from general service manager to vice president of maintenance and engineering of Cummins Sales & Service, Inc., and J. L. Peeler, former assistant purchasing agent at Fort Worth, appointed to director of purchases.

Ellis' sales and service experience includes work as export service manager with Mid-Continent Cummins Export Corporation in New York City, mechanic for Cummins Sales & Service, Inc. at Odessa, Texas, and service manager for the organization at Houston, Texas.

In 1935, Peeler began working for Mid-Continent Supply Company, and with this company was store manager at both Odessa and Seagraves, Texas, and diesel department manager at Fort Worth. Peeler has been with Cummins Sales & Service, Inc. since its organization in 1946.

R. F. Muenster

A. L. Murry

Mid-Continent Supply Promotes A. L. Murry and R. F. Muenster

R. F. Muenster has been promoted from store manager at Wichita Falls to North Texas district machinery manager and A. L. Murry from Wichita Falls field salesman to store manager at the same location, in changes announced by Mid-Continent Supply Company.

Muenster had been with the company for six years as store manager until his recent promotion. Before joining Mid-Continent he was employed by two tool companies and a supply company.

Murry has been with Mid-Continent six years, four of them as field salesman. He is a graduate of Texas A. & M. College.

Templeton, Kenly & Company Consolidates New York Office

Templeton, Kenly & Company, Chicago manufacturer of Simplex mechanical and hydraulic jacks, has consolidated its New York domestic and export offices. E. A. Zimmerman has been named director of both operations. Zimmerman previously was manager of New York domestic sales and has been associated with the Simplex line for many years.

Continental Supply Appoints

The Continental Supply Company, Dallas, has appointed three new store managers. F. E. Amacker, Jr., is now manager of the Harvey, La., store; R. M. Bynum has been named store manager at Carthage, Texas; J. L. Powell has been appointed store manager at Liberal, Kansas. All were promoted from field salesmen capacities.

Pressed Steel Buys Axelson

Axelson Manufacturing Company has been purchased by Pressed Steel Car Company, Inc., and will operate as a division of the latter company. Pressed Steel took over the operation without interruption and maintained management, employes, facilities, plants and locations.

Baroid Names Doyle Manager Of Distribution At Houston

Baroid Sales division, National Lead Company subsidiary, has promoted a Houston based employe and added a new member to its Houston staff. James J. Doyle, who joined Baroid in 1939 upon graduation from Texas A. & M. College, has been appointed distribution manager with headquarters in Houston. He was serving as purchasing agent until elevated by this promotion.

W. B. Kirkland, formerly associated with the Lone Star Roofing Company, has joined the company as purchasing agent in Houston. Kirkland graduated from South Texas College of Commerce in 1947.

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INSTALLED AT WELL!
REMOVES PARAFFIN
NO WELDING NECESSARY
SAVES TIME
SAVES MONEY
★ CAN BE SALVAGED and used again on new rods.
★ Spaced for any stroke length.
★ Will not slip if rod is stressed. Tested for 2350 lbs. grip.
★ Now in use in EVERY AREA where paraffin is a problem.
★ Sizes available for IMMEDIATE delivery to fit ⅝" to 1" rods in 2", 2½" and 3" tubing.
AVAILABLE THROUGH YOUR SUPPLY STORE
Conveniently packaged and easily identified!
DISTRIBUTED BY SUCKER ROD MANUFACTURERS
MANUFACTURED BY
The TRIPPLEHORN CO.
P O BOX 6326
DALLAS, TEXAS

R. E. Gathings

K. C. Van Orden

Southern Geophysical Company Adds Gathings and Van Orden to Staff

R. E. Gathings and K. C. Van Orden have joined the staff of Southern Geophysical Company in supervisory positions.

Gathings has resigned as vice president and supervisor of Southwestern Consultants, Inc., and has joined Southern as a supervisor and is stationed in California. Gathings is a graduate of Sewanee University with a major in physics. His geophysical experience has been in West Texas, New Mexico and the Rocky Mountains.

Van Orden has been in geophysical work for ten years, operating in Texas, Oklahoma, Kansas, Colorado and Canada. He holds a B.S. degree from Macalester College, St. Paul, with a major in mathematics and an M.A. degree from the University of Minnesota. He is a member of the Society of Exploration Geophysicists and the Kansas Geological Society. He is stationed in the San Juan Basin in Colorado reporting to the Rocky Mountain division office in Denver under the direction of Elmer F. Blake, vice president.

Worthington Consolidates Drive Operations at Oil City Plant

All Multi-V-Drive and Allspeed Drive operations have been consolidated by Worthington Corporation at Oil City, Penn. The new division created by the consolidation is known as the Mechanical Power Transmission Division. Manufacturing operations are under the direction of W. F. Weinreich, works manager of the Oil City plant, and Fred G. Moore, chief engineer of the new division. D. E. Tessendorf has assumed the duties of sales manager and will be assisted in those duties by H. W. Kumro.

Brazier Is Named Superintendent of BJ Service District in West Texas

Richard M. (Dick) Brazier has been appointed district superintendent of the Seagraves, Texas, district for BJ Service, Inc., Los Angeles subsidiary of Byron Jackson Company.

R. M. Brazier

Brazier, a petroleum engineering graduate of the University of Southern California, joined BJ Service upon his release from the Navy Air Force after World War II. In 1951 he was made division sales engineer in the Midland division. His district includes Hobbs and Lovington, N. M.

National Lead Adds Pioneer Alloy Products to Organization

National Lead Company has formed the Pioneer Alloy Products Division, which on October 1 took over the manufacturing operations of the Pioneer Alloy Products Company, Inc., of Cleveland. Pioneer produces stainless steel castings; National Lead manufactures lead and lead alloy products and oil well drilling muds, in addition to a long line of well-known products.

Manufacturing operations of the new division will be located in Ellwood City, Pennsylvania, in a National Lead Company plant equipped as a foundry and machine shop.

L. J. Gambow, general manager of the Pioneer Alloy Products Company, Inc., will become sales manager of this new division of National Lead Company.

Hurd and Curtiss Named in Promotions at Buffalo Bolt

Two promotions within the Buffalo Bolt Company, a division of the Buffalo-Eclipse Corporation, were effected recently. Lawrence L. Hurd, formerly assistant general sales manager of the Bolt Company, was promoted to the position of director of public relations of the Buffalo-Eclipse Corporation. Coleman Curtiss, Jr., formerly assistant to the vice president sales of the Buffalo Bolt Company, succeeds Hurd as assistant general sales manager.

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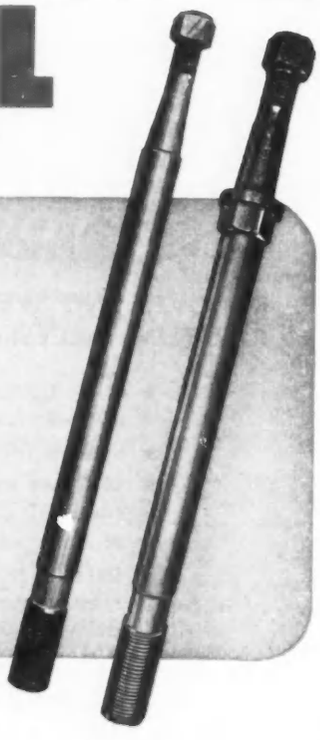
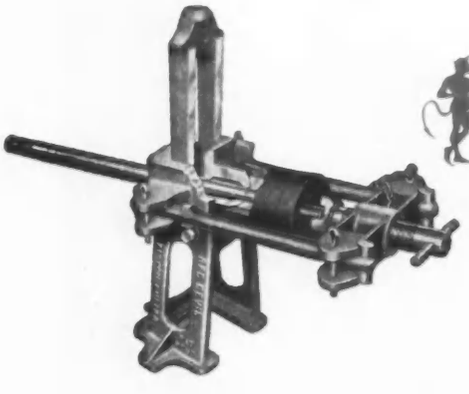
"DIA-HARD" PISTON RODS

For high pressure abrasive service

RED DEVIL Piston Rods are first choice where drilling conditions are severest because of the extreme hardness of the deep HIGH-CARBON wear resistant "DIA-HARD" case, coupled with tough core properties which give the highest tensile strength against breakage. All rods are hardness tested and precision gauged to maintain a world-wide reputation for quality. Write for Catalog No. P-101.





RED DEVIL PISTON PULLER

For tapered type rods

The usual practice of removing pistons from rods by blows of a sledge hammer often damages either pistons or rods. A Red Devil piston puller easily and quickly removes badly stuck pistons without injury to either part. All elements are made of finest quality alloy steel, heat-treated for strength and long life. Write for Catalog No. P-106.

RED DEVIL PISTON ROD LOCK NUT

These "Hammer Lug Type" nuts provide a fast and positive means for locking piston rod in crosshead. Made from alloy steel and heat treated, they will last indefinitely. Face of nut is precision machined for full seating surface at right angles to axis of threads to prevent fatigue stresses in rod. Write for Catalog P-102.

Complete information in Composite Catalog or write for price catalogs noted above. Red Devil products are available through your supply store.

OIL WELL MANUFACTURING CORP.

6008 S. Alameda Street, Los Angeles 1, California

Two Staff Members Promoted By Rockwell Manufacturing

Rockwell Manufacturing Company has promoted two staff engineers. Howard J. Evans, who joined Rockwell in 1935 as an engineer at Pittsburgh, has been named chief engineer. Robert J. Sarraf, on the Rockwell staff since 1947, was named chief chemical engineer.

Evans, an active member of the ASME and AGA associations, has written many technical articles for journals in the gas field, and has taught extension courses in conjunction with the Pennsylvania State College. He will be assisted by Richard F. McCormick, chief products engineer for gasoline and oil products; Bernard Last, development engineer on lubricant accessories; and W. S. McLay, chief draftsman.

Sarraf will be assisted by L. M. Van der Pyl, chief chemist.

Byron Jackson Increases Board, Names Malcolm Smith Director

Byron Jackson Company has increased the number of members on its board of directors from eight to nine, and named Malcolm Smith to fill the new position on the board. Smith, a director of the Spencer Chemical Company and The Vendo Company, both of Kansas City, has maintained offices in the General Petroleum Building, Los Angeles, since 1948. He began his investment banking career with Bond & Goodwin, Inc., in 1928, subsequently being associated with Glore, Forgan & Company and J. H. Whitney & Company, all of New York.

Cummins Engineering Department Promotes Miller, Worth, Reiners

Cummins Engineering department has promoted three members of its personnel. J. C. "Joe" Miller, former manager of Research and Refinement, has been named executive engineer in charge of Product Engineering and Research activities. Miller had 20 years experience in the automotive field prior to joining Cummins in 1947.

D. B. "Dan" Worth, manager of Product Engineering, has been named manager, field quality, and will coordinate field and factory studies of product quality control.

N. M. "Nev" Reiners, manager of the Research Laboratory, has been promoted to manager of Research and Refinement. Reiners has been in Cummins employ since his graduation from North Dakota State College in 1936.

Le Roi Company Names Three New Directors to Board

Le Roi Company has elected E. O. Boshell, G. V. Meyers and J. Carlson as new members of its board of directors. Other directors of the Milwaukee firm are T. O. Liebscher, president; P. W. Eells, vice president and R. R. Morgan, vice president in charge of Le Roi's Cleveland division.

E. O. Boshell is chairman of the board and president of Westinghouse Air Brake Company of Wilmerding, Pa. Meyers is controller of the Pennsylvania firm, while Carlson is the assistant to the president.

Westinghouse Air Brake recently acquired a controlling interest in Le Roi Company through the purchase of a majority of Le Roi's common stock at $9 per share.

Reed Roller Bit Names Three Cleco Division Distributors

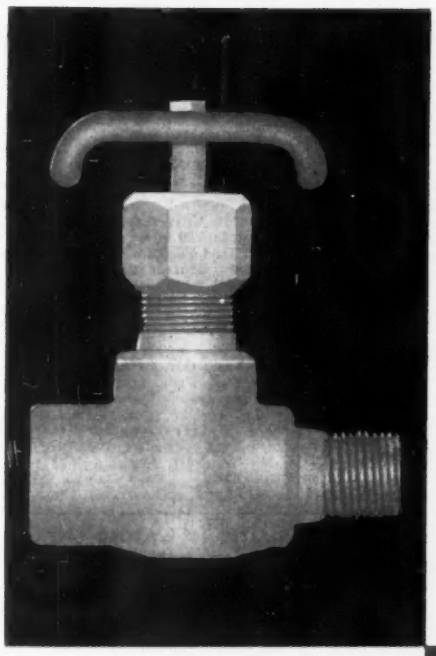
Three new distributors have been named by the Cleco Division of Reed Roller Bit Company, Houston. Electric Tool & Supply Company will represent Cleco products in Los Angeles. Industrial Supplies Company has been named distributor for Steubenville, Ohio. Florida Aviation Corporation will represent Cleco products in the Miami area.

Cleco manufactures the Cleco and Dallett lines of air tools and accessories. The Division recently opened a sales office and warehouse in Detroit under the management of B. O. Stoothoff.

Baroid Sales Announces Two Personnel Changes in Division

Floyd E. Palmer, assistant general sales manager of Baroid Sales Division since 1950, has been transferred from Houston to Denver for closer contact with the Rocky Mountain territory. In the same division, A. B. McDaniel, distribution manager since 1948, has been named assistant general sales manager.

Palmer joined Baroid 20 years ago as a surface engineer and was named a superintendent in 1943 and a division sales manager in 1945. McDaniel has been with Baroid since 1935, having previously been associated with Standard Oil Company of Bolivia and Phillips Petroleum Company.



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There is a difference in needle valves . . . and O-C-T makes the difference

O-C-T Needle Valve bodies are single piece drop forged steel. The male thread is made as an integral part of the valve which gives you a more compact, stronger connection. This one-piece O-C-T Needle Valve design eliminates the use of nipples and minimizes the chances for leakage. Buy O-C-T Needle Valves from your supply store. There is a difference . . . and O-C-T makes the difference!

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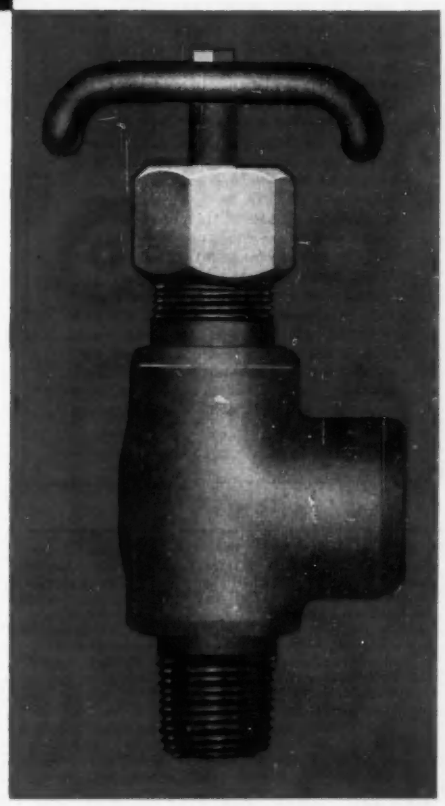
Export Representatives: Sterling Areas — Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston 1, Texas.



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RATES: Regular Classified (undisplayed) set in this size type: 12 cents per word. Minimum charge, $3. Blind box address in our care counts six words. Replies forwarded without charge. Situation wanted ads, 6 cents per word. Display ads, set in suitably larger type with ruled border, $12 per column inch; situation wanted display ads, $6 per column inch. Ten percent discount for two or more insertions of same copy in consecutive issues. All classified ads payable in advance. COPY DEADLINE: 5th of month preceding date of issue. Send copy and checks to: Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.

MISCELLANEOUS

A Winter Vacation In Arizona?

Let me tell you about REX RANCH, 39 miles south of Tucson.

When, as a guest of Rex Hamaker, known to oil men throughout the world, I visited REX RANCH a year ago, I was entranced.

Perched on a bench of the Santa Rita Mountains, overlooking the beautiful Santa Cruz Valley, the scenery took my breath; a green valley below, around, glorious mountains. Mr. Hamaker had owned the ranch for several years, since a time when his doctor told him to take a rest where the air would be perfect.

I was so enthused that I made a contract with Mr. Hamaker, resigned my position as manager of River Oaks Country Club in Houston, and hurried back to the ranch. Now, after a year's preparation we are ready for guests. Our guest houses of native adobe contain every comfort and are beautifully appointed; one of the finest swimming pools in Arizona; a recreation building that is a joy to see—and food! I've been engaged in catering to discriminating people in fine clubs in California and Texas for a score of years.

Back of the ranch houses, 4000 acres of real Arizona ranch land; excellent horses for guests; special trips into the richly mineral, nearby mountains; only 25 miles from Nogales and across the border; not too far from Guaymas, Mexico's famous sport fishing place.

The countryside is rich in tradition and scenery. There is no air like Arizona air, no sunsets like ours. Yes, I **am** enthusiastic and you will be too when you visit us. For information and illustrated brochure write to Fred Gregory, Rex Ranch, Amado, Arizona.

HELP WANTED

■ Manufacturers representative for established line of oil field specialties in Canada. Also in North Texas, Panhandle and West Texas-New Mexico area. Advise experience, lines now being handled and territory covered. Box 2632, Tulsa, Oklahoma.

■ Well integrated oil company, operating in the Mid-Continent and Rocky Mountain areas, is interested in a capable and experienced geologist with sufficient geologic background and experience in exploration to assume the position of Manager of Exploration and Geological Departments. Salary open. All replies will be held in strict confidence. Box 65-W, c/o WORLD OIL, Houston, Texas.

FOR SALE

TECHNICAL DICTIONARY
ENGLISH-SPANISH & SPANISH-ENGLISH
Containing Geological, Engineering, Legal and Accounting words, terms and expressions common to the Petroleum Industry, and 800 abbreviations.—394 pages—$5.00.
T. A. KOLSTER
Creole Petroleum Corporation
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■ 1 Model 1550-C, 2½ x 5 x 10, Gaso Pump. Complete with Mission Valves & Pistons. Ready for use. Will sell for $1,750.00 (½ of new price). 1 International 450 Red Diamond Engine, complete with Radiator, Clutch & Transmission. Total time on engine 5 hours. Will sell at sacrifice. Delivered price $1,000.00. Write or phone 2170. Producers Chemical Service, 1404 S. Cedar, Borger, Texas.

FOR SALE OR LEASE

■ **Longest established Pipe and Supply yard in the heart of the South Texas oil fields—consisting of ten acres of land—office building (with living quarters)—shop (two pipe machines)—warehouse—storage building. Out of the city limits on main highway. If interested write Box 1495, Alice, Texas. Phone 525, 2358 or 264J.**

SITUATIONS WANTED

■ EXPERIENCED GEOLOGIST, age 36, Master's degree, desires to relocate with small active independent preferably in Rocky Mountains or Texas. Seven years diversified experience in geology and well engineering in Southwest Texas, Mississippi, Louisiana and Alabama. Also experienced commercial pilot. Presently employed by large independent. Box 64-W, c/o WORLD OIL, Houston, Texas.

■ Geologist, MS, twelve years exploration, production and administrative geological experience with major and small companies. Presently employed in responsible position but desires connection with active independent or drilling firm. A high percentage of deals recommended have found oil. Let me evaluate, develop and promote your deals. Oklahoma location. Write 62-W, c/o WORLD OIL, Houston, Texas.

Drilling contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box 94-W, WORLD OIL, Houston 1, Texas.

DECALS

TRUCK LETTERING AND TRADEMARK decals made for your trucks. Easy to apply, uniform, distinctive, economical for small or large needs. Write for Catalog. Mathews Company, 827 S. Harvey, Oak Park, Ill.

HELP WANTED

■ Assistant Controller—Integrated Oil Company in Mid-Continent area is seeking an experienced Assistant Controller. Position requires top-level man with experience in oil, systems and costs. Please submit resume which must give complete data on experience, salary requirement, and personal history, including education, background and associations. Box 61-W, c/o WORLD OIL, Houston, Texas.

Massey Appointed By Rolo

J. W. Massey, Jr., was recently appointed West Texas representative for Rolo Manufacturing Company with headquarters at Midland. Massey formerly was associated with Ray S. Kail in South Texas. At Midland he will handle sales and service for Rolo Wellcheckers and Oil Well Metering systems.

Will Handle Worthington Drives

A distributorship agreement has been signed by Service Engineering Company, Inc., Tulsa, with Worthington Corporation whereby the Tulsa firm will handle Worthington's Multi-V-Drives and All-speed Selectors. For the past two years the firm has been serving oil fields in eastern Oklahoma, eastern Kansas, southwest Missouri and northwest Arkansas.

Named South Texas Representative

Rector Well Equipment Company, Inc., has appointed Howard Johnson district representative with headquarters in Corpus Christi. Johnson was transferred from Alice, Texas, to head the South Texas area. Prior to joining Rector, Johnson had been with a major oil company doing field service work in Louisiana.

Marlow Opens Arkansas Plant

A complete branch factory of 16,000 square feet has been put into operation at De Queen, Ark., by Marlow Pumps of Ridgewood, N. J. The new plant, supplementing plants in Ridgewood, Coalville, England, and St. Cloud, France, insures faster delivery to the Southwest.

BUSINESS OPPORTUNITIES

■ **WE WILL BUY Producing Oil Royalties. Send Particulars. Standard Security Co., 111 Broadway, New York 6, New York.**

WILLISTON BASIN ROYALTIES

Dealers in Montana royalties since 1921, we now specialize in royalties under major company leases in the Montana portion of the Williston Basin. For information on our method of operation, write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.

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Established sales organization operating in Texas, Louisiana and Southern Arkansas is in position to represent an additional manufacturer. Sales personnel includes graduate engineers. Active representation assured by experienced personnel already well acquainted and successfully serving the petroleum industry. Box 63-W, c/o WORLD OIL, Houston 1, Texas.

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Immediate delivery of producing and pipe line forms made from our complete line . . . Write for completely illustrated catalog.

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P. O. Box 2608 Houston 1, Texas

New Books, Maps and Movies

CONCILIATION IN ACTION, Edward Peters, National Foremen's Institute, Inc., New London, Conn. $4.50.

Edward Peters is a conciliator of the California State Conciliation Service. This book is designed to give management, negotiators, labor relations people and conciliators the inside working techniques of present day collective bargaining and conciliation practice. Many case studies in labor relations are recalled. The first section of the volume sets the essential groundwork for discussion of successful conciliation by summing up the events that lead up to deadlocks in collective bargaining. The second section traces the factors that will influence the conciliator's role.

A PRIMER OF PIPE LINE CONSTRUCTION John Woodruff, Texas Petroleum Extension Service, University of Texas, Austin. $1.

Sponsored by the Pipe Line Contractors Association of Dallas, *Primer* describes the building of an underground transportation system for natural gas, crude oil and refined products. The material is written in layman's language. Gulf Oil, Humble Oil and Refining and Shell Oil companies supplied photographs which supplement the text.

NATURAL GAS PRODUCTION AND TRANSMISSION, A Study Course, Institute of Gas Technology, 17 West 34th Street, Technology Center, Chicago 16. $37.50 to Libraries or Companies for complete course.

The Institute offers an extension course for home study to all members of the gas industry. The complete course is comprised of eight sections, with two chapters contained in each study section. The courses are prepared in cooperation with the American Gas Association. The text is presented in language that can be understood by persons with little or no training in the fields under discussion, but is comprehensive enough to serve as refresher courses to those in the industry who have specialized in one phase of the work.

SECONDARY RECOVERY OPERATIONS IN NEW MEXICO to 1951, and, SECONDARY RECOVERY OPERATIONS IN ARKANSAS during 1951, Interstate Oil Compact Commission, Headquarters Office, Box 3127, Oklahoma City 5. No charge.

The first report was prepared by the New Mexico Secondary Recovery Committee with Glenn Staley, chairman, and R. R. Spurrier, vice chairman. It covers the four projects operating in New Mexico. Maps and charts furnish graphic data on these projects.

The Arkansas data were prepared by that state's committee under Walter L. Dobie, chairman. This report covers nine active projects in Arkansas together with four projects which have been abandoned. Description of the operations is clarified by graphical pressure production histories prepared by the Arkansas Oil and Gas Commission.

REVIEWS OF PETROLEUM TECHNOLOGY. Volume 12. Institute of Petroleum, 26 Portland Place, London W. 1. About $7.

This volume covers the year 1950 in general and practically all phases of the petroleum industry are dealt with. There are more than 3300 references to articles which appeared in the literature during the period under review. Also included are a few reviews from the 1949 period. Subject and name indexes, and a library of summarized information.

HANDBOOK FOR LANDMEN. Milan C. Rowold, Broaddus Honeycutt, 11012 Greenbay Drive, Houston 24. $25.

This book provides a cross-indexed reference on farmout letters, purchase agreements, inheritance, probate, proper execution of leases and deeds, leasing by guardians and executors, adverse possession, prescription, limitation title, payment of rentals, dowry, vacancies, taxes, recording practices, and other related subjects. The author has been with Humble Oil & Refining Company 26 years.

Keep bottom water out of your wells—and prevent costly shutdowns—by tamping Eagle-Picher Lead Wool in the hole. A watertight plug that seals every crack and crevice is made by this finely stranded, flexible metallic wool. Shipped in convenient 50-lb. sacks . . . easy to spot in special cartridge-shaped Eagle-Picher Wire Containers sized to fit all casings. Order through your jobber.

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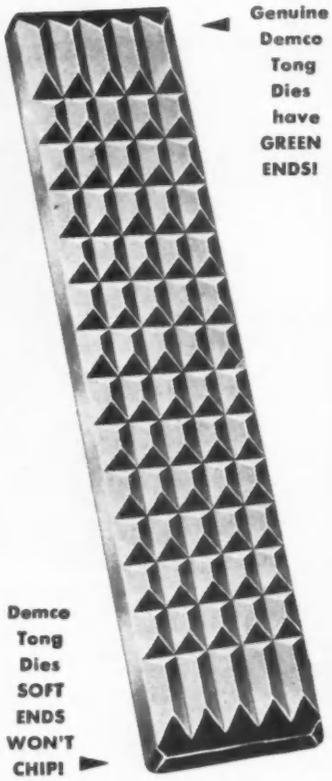

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Demco Tong Dies SOFT ENDS WON'T CHIP!

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FOR SAFETY'S SAKE always get the original Demco "No Chip" soft end tong dies! They help reduce accidents on the derrick floor. And even on flame hardened surfaces Demco Tong Dies give you maximum gripping power! They're reversible, for longer wear and easy installation!

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SQUEAKS from the BULLWHEEL

A Matter of Record

In a debate in the British parliament where a Laborite was defending the labor government's socialized medicine program, he was being heckled by a well-trained Tory in the gallery. As he expounded the benefits of paternalistic government medicine, he boomed: "Why in Britain today, we have more bonny babies than ever before. And why—?"

Before he could answer his rhetorical question as planned, one unrespectful heckler shouted: "PRIVATE ENTERPRISE."

Cafe Episode

Waiter: "How did you find your steak, sir?"

Diner: "It was just luck. I happened to move that piece of parsley, and there it was."

His Name Is Legion

Bert: "Give me a cigarette, Bill."

Bill: "I thought you had quit smoking."

Bert: "Well, I got to the first stage. I've quit buying."

By Their Deeds—

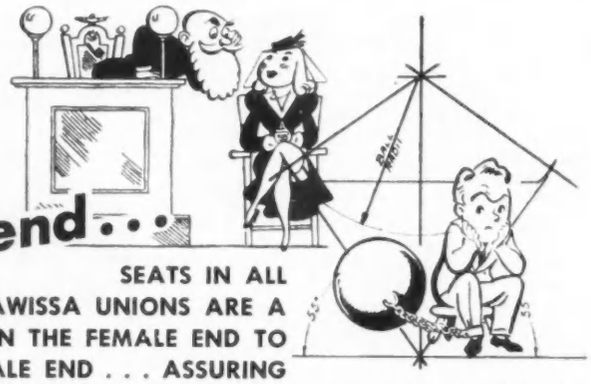
"I just got out of prison this morning," a traveler told a man on the train. "It's going to be rough, facing old friends."

"I can sympathize with you," replied the other, "I'm just getting home from Congress."

One Man's Philosophy

One wolf thinks he is entitled to life, liberty and the happiness of pursuit.

it's the ANGLE on the female end...



SEATS IN ALL CATAWISSA UNIONS ARE A 55° ANGLE ON THE FEMALE END TO A BALL ON THE MALE END . . . ASSURING A PERFECT SEAL EVEN 'THOUGH THE PIPE IS NOT IN ALIGNMENT!

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catawissa ∧ unions
are made by union specialists!

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a type for every use . . . all temperatures, all pressures!

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60 MILL ST. CATAWISSA, PENNA.

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THE BIT THAT CUTS DOWN THOSE COSTLY ROUND TRIPS

Here's a bit that will drill more hole faster in hard, abrasive rock than any known tool! It has proved itself in West Texas, Oklahoma, and Rocky Mountain areas.

In many cases, the HUGHSET bit is drilling 3 to 10 times the footage normally drilled with regular hard formation bits in cherty and hard quartzitic formations.

Not only does the HUGHSET bit drill faster, it stays on bottom longer . . . making hole. The result is a material reduction in those time-killing, costly round trips.

Your local Hughes representative will be glad to advise you as to the conditions under which the HUGHSET bit can be run to the best advantage.

A Big Job

NEEDS THE RIGHT EQUIPMENT

● Drilling an oil well is a big job...particularly when footage runs miles deep. Takes the right kind of rig...with skilled, experienced men to handle all operations.

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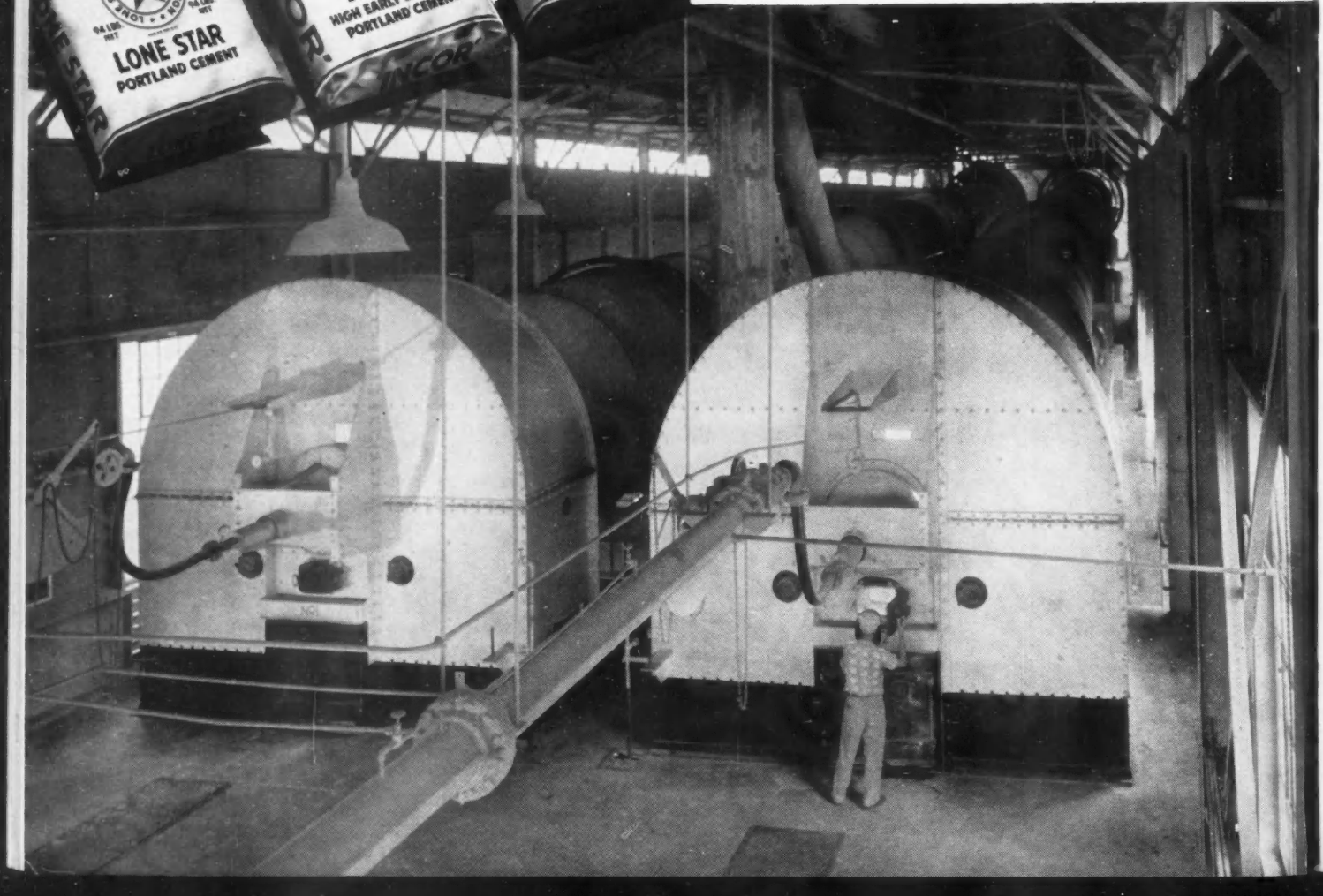
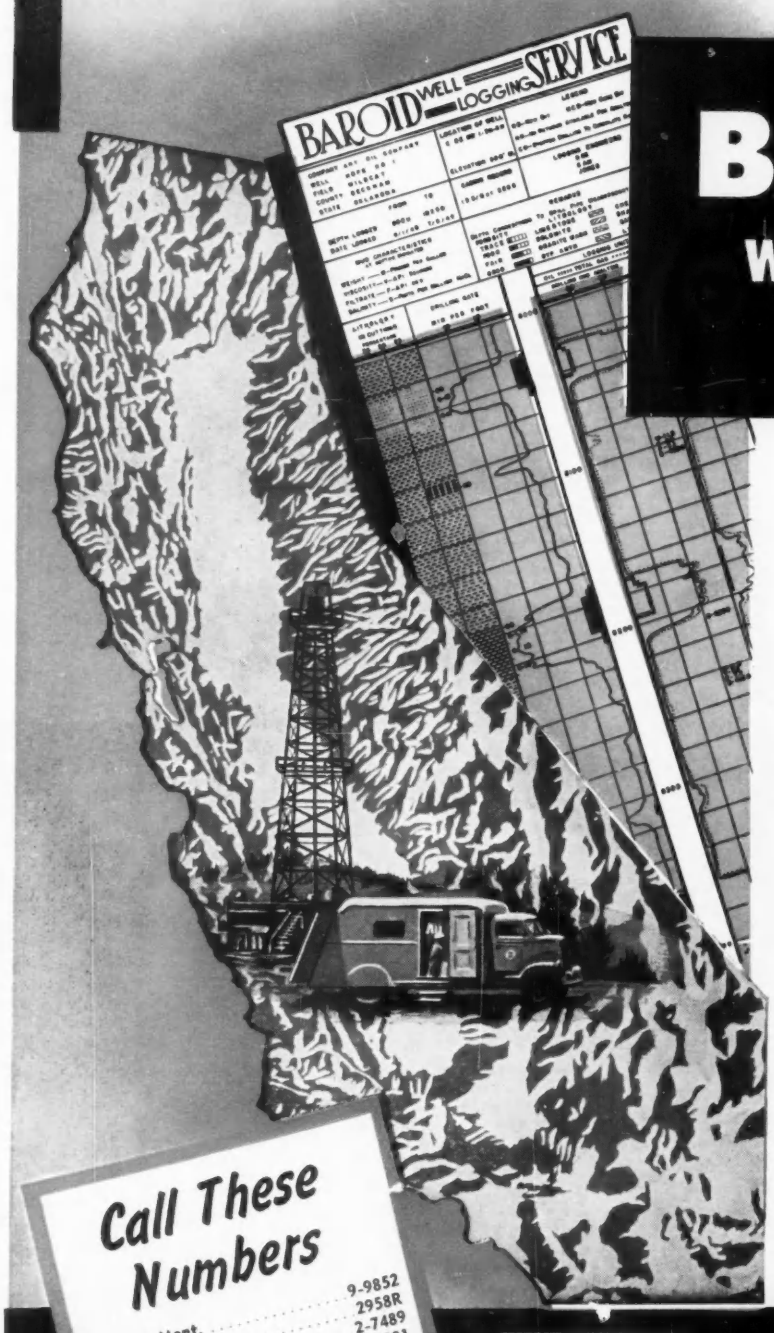


Where FOLDING and FAULTING make correlation difficult



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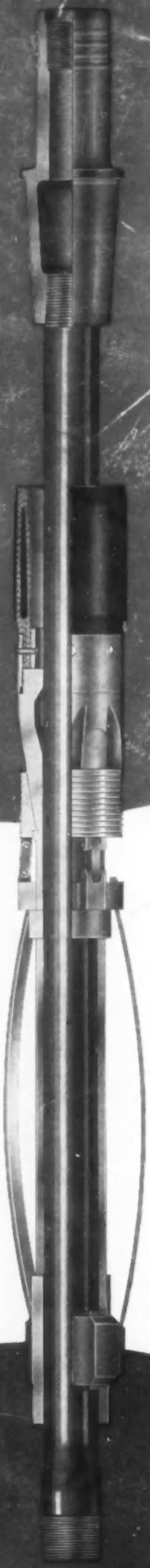

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